



CRANFIELD UNIVERSITY

Esteban Lizarazo

**Contextual Factors Shaping Surgeons' Power Dynamics and
Influence in Hospital Inventory Systems: An Exploratory Study**

Cranfield School of Management
Doctor of Business Administration
Academic Year: 2023 -2024

Supervisors: Dr Nicky Yates and Professor Michael Bourlakis
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ABSTRACT

Although many studies have addressed the impact of stakeholders' power dynamics on supply chain processes within the healthcare sector, a comprehensive understanding of how hospital context, specifically funding orientation and surgeons' contract arrangements, shapes these dynamics within Inventory Management (IM) in the Operating Theatres (OTs) remains notably absent. This doctoral thesis endeavours to bridge this gap by conducting an in-depth investigation into the influence of surgeons through power dynamics in four hospitals using multiple case study methods.

In doing so, the central inquiry focuses on how a hospital's funding orientation (public or private) and surgeons' contract arrangements (hospital-based or non-hospital-based) influence the power dynamics over SCM practices, particularly in the inventory management (IM) field. The case studies reveal a close association between surgeons' power and these organisational and environmental contextual elements. Notably, a high level of surgeons' influence in the IM process is observed in contexts characterised by private-funding orientation and non-hospital-based physician arrangements.

Conversely, the hospital case with public-funding orientation and hospital-based surgeons exhibited low levels of surgeons' influence within the IM process. Recognising these contextual distinctions is crucial for Healthcare managers, SCM professionals and policymakers. This thesis gives them valuable insights into improving and implementing hospital SCM practices, acknowledging key stakeholders' power dynamics and influence.

Keywords: Supply Chain Management, Inventory Management, Healthcare, Hospitals, Operating Theatres, Physicians, Surgeons, Power, Influence, Contextual factors, Stakeholder Theory, Resource Dependency Theory, Case Study.

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LIST OF ABBREVIATIONS

CCO	Chief Commercial Officer
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CMO	Chief Medical Officer
COO	Chief Operating Officer
EHR	Electronic Healthcare Records
EMR	Electronic Medical Records
ERP	Enterprise Resource Planning
FDA	Food and Drug Administration
FTE	Full-Time Employee equivalent
GDP	Gross Domestic Product
HC	Healthcare
HCSC	Healthcare Supply Chain
HCSCM	Healthcare Supply Chain Management
ICU	Intensive Care Unit
IM	Inventory Management
IS	Information Systems
KOL	Key Opinion Leader
KPI	Key Performance Indicator
NA	Not applicable
NHS	National Healthcare System
OECD	Organisation for Economic Co-operation and Development
OT	Operating Theatre
PPI	Physician Preference Items
RDT	Resource Dependency Theory
RQ	Research Question
SCM	Supply Chain Management
SKU	Stock Keeping Unit
SLR	Systematic Literature Review
ST	Stakeholder Theory
UK	United Kingdom
UN	United Nations
VBP	Value-based Payment
VMI	Vendor Managed Inventory
WHO	World Health Organisation

1 INTRODUCTION

“I am not my doctors’ “customer,” thank you; these people are professionals with whom I trust my health. I do not give some hospital my “business” because I am not a buyer who wishes to beware. Nor do I “consume” healthcare services, because they might consume me. I hope that my physicians and nurses are not “human resources” who need to be “empowered,” but rather dedicates human beings who are personally engaged. Diseases are not “markets,” and professional healthcare services are not “products” to be plucked off some shelf at arm’s length” (Mintzberg, 2017, p. 90)

1.1 Motivation and the Phenomenon to Investigate

At the inception of this idea and the beginning of this journey, the author held the position of Chief Operating Officer at a prominent pharmaceutical and medical devices company in Latin America. His role gave him valuable experience and stimulated his passion for supply chain management (SCM). During his interactions with hospital customers, he noticed that SCM performance in hospitals often fell short of industry expectations, a subject close to his heart, given his background in the pharmaceutical and medical devices sectors. Furthermore, discussions with hospital logisticians regularly highlighted the challenges of implementing effective SCM practices, consequently leading to suboptimal SCM performance.

“They (surgeons) always complain because, again, we prepare a standardised surgical tray with certain products, but they do not accept them and want their special items,” – as highlighted by a Logistician involved in this study.

Conversations with numerous hospital supply chain practitioners gradually unveiled a phenomenon in which some hospitals outperformed others regarding their SCM practices. This observation awakened the author's curiosity, driving him to explore the potential factors causing these disparities in SCM performance. Early in his doctoral journey, he encountered extensive literature praising the benefits of SCM practices, particularly their capacity to reduce costs and improve patients' benefits (Burns, 2008; Rosenstein, 2004). However, a

paradox persisted; despite this substantial academic literature, healthcare organisations struggled with the practical application and realisation of these SCM practices (Jarrett, 1998; Landry et al., 2016). This puzzling paradox demanded a thorough investigation, leading the author to the following problem formulation: *Why did some healthcare institutions struggle to implement and deploy SCM practices despite extensive literature praising their virtues regarding cost and patient benefits?*

As part of the author's academic program, he conducted a positioning study in line with Cranfield University requirements. His exploration uncovered extensive literature on information systems, quantitative optimisation models, and a dearth of research on organisational systems impacting SCM practices. However, a pivotal turning point came when he encountered an article by Jan De Vries (2011), which posited that stakeholders' power and interests could potentially (re)shape supply chain processes like the inventory system (De Vries, 2011). This concept resonated profoundly, setting the cornerstone for the author's academic research into the influence of stakeholders on SCM practices.

Simultaneously, the author experienced a significant career transition, ascending to the CEO role. This role highlighted the need to understand how to handle the complex terrain of selling pharmaceutical and medical device products to hospitals. He knew from the literature at this stage that physicians were one of the key influencers on SCM processes and that in some hospitals, the impact could even be around 60% of the total SCM expenditures (Montgomery and Schneller, 2007), something worthy of investigating from a practical and theoretical perspective. This revelation motivated the author to examine further organisational and environmental factors that might impact physician influence, as suggested by literature (Aptel and Pourjalali, 2001; Budgett et al., 2017; Issahaku et al., 2021; Lingg et al., 2016; Nyaga et al., 2015; Pouloudi, 1999).

Nevertheless, the author felt that there was something more, a subtle yet impactful phenomenon lurking beneath the surface. It appeared that this phenomenon did not affect all hospitals uniformly. Intriguingly, he observed physicians working across more than one hospital exert their influence differently

in each organisation. Furthermore, in his early shallow observations, some hospitals seemed unaffected by this phenomenon, with physicians holding no sway over SCM practices. In contrast, other hospitals witnessed a remarkable power of physicians, but curiously, there were some hospitals under this category where physicians held considerable power but aligned their interests with SCM practices and logisticians. The little research on contextual factors affecting SCM practices in healthcare (Budgett et al., 2017) and the lack of research exploring how contextual elements impact the physician's influence and the power dynamics in hospitals intensified this curiosity, amplifying the need for investigation (Boonstra et al., 2008).

Thus, a compelling motivation emerged: to explore the contextual factors within hospitals that affect the influence of physicians' power on SCM practices, addressing a notable gap in the literature. This endeavour held the potential to enrich the theoretical understanding of SCM system dynamics, offering practical insights that could empower and guide SCM practitioners and hospital managers to implement SCM practices more effectively.

Therefore, the author's approach evolved from contemplating discrepancies and variations in SCM performance across hospitals to a qualitative exploration of the contextual factors affecting physicians' power dynamics in (re)shaping SCM practices. His motivation remained unwavering in this academic challenge as a doctoral candidate, from his purpose as a practitioner: *to help hospital and supply chain managers enhance their SCM practices by comprehending the physicians' power dynamics according to different hospital contexts and understanding how these dynamics influenced SCM practices*. Acknowledging the type of context of each hospital, Supply Chain and hospital managers will either improve existing practices or pave the way for innovative SCM strategies. In essence, this journey embarked upon by the author is driven by the recognition of the theoretical and practical contributions inherent in unravelling the multifaceted contextual factors that shape the hospital's SCM.

1.2 Existing Literature

In recent years, there has been increasing interest in examining the influence of physicians within hospital SCM and the subsequent reshaping of tasks and practices within this field (Doolin, 2004). Research in this area underscores the significant role of physicians' power and interests, as they often (re)shape and (re)define SCM practices (Boonstra et al., 2008; Currie et al., 2015; Hussain and Cornelius, 2009; Jensen et al., 2009; Kumar et al., 2022; Lux and Petit, 2016; Schlichter and Rose, 2013; Sun, 2021; De Vries, 2011; Walley, 2013).

Physicians' influence is especially pronounced in Inventory Management (IM) practices, where their preferences frequently drive the demand for specific high-value items, particularly within surgical settings. The IM practices observed in this research and well-documented in the IM literature include inventory tracking and replenishment (Çakıcı et al., 2011; Bendavid et al., 2010; Rosales et al., 2014), Vendor Managed Inventory – VMI (Bhakoo et al., 2012; Krichanchai and MacCarthy, 2017; Matopoulos and Michailidou, 2013), planning and control systems (Dellaert and van de Poel, 1996; Bijvank and Vis, 2012; Opolon, 2010), as well as the standardization and aggregation of SKUs (Cox et al., 2005; Montgomery and Schneller, 2007; Nicholson et al., 2004; Rosenstein, 2004). This thesis explores how organisational and environmental contextual factors influence these practices by shaping the power dynamics of surgeons within the hospital's IM system, ultimately impacting how inventory management is adapted and implemented in healthcare settings.

In this context, SCM provides a comprehensive framework encompassing essential functions, such as procurement, logistics, and IM, designed to support efficient and responsive supply chains (Mentzer et al., 2001; Hugos, 2024). Hugos (2024) emphasizes SCM as coordinating production, inventory, location, and transportation decisions among supply chain participants, balancing responsiveness with cost efficiency. This coordination allows organisations to manage the upstream and downstream flows of products, services, information, and finances across different entities in the supply chain (Lambert et al., 1998). Within this overarching framework, IM ensures essential supplies are available in

optimal quantities, managing the risks of stockouts or excessive inventory, a particularly critical function in high-stakes healthcare settings like operating theatres (Burns et al., 2001).

The healthcare sector, however, faces unique SCM challenges (Kim and Kwon, 2015; Towill and Christopher, 2005; Volland et al., 2017). Hospitals must account for high variability in clinical needs, fluctuating demand, and diverse medical approaches (Lega et al., 2012). Ageing populations, advancements in chronic disease treatments, and rising healthcare costs further underscore the need for streamlined SCM (De Vries and Huijsman, 2011; McKone-Sweet et al., 2005). Traditionally, hospitals have considered themselves distinct from other sectors due to these complexities, yet SCM provides promising solutions to improve operational efficiency, manage costs, and support quality improvement (Jarrett, 1998). Kim and Kwon's (2015) review highlights the significant potential benefits of SCM in healthcare, pointing to missed opportunities for waste reduction and cost control in a sector where supply chain expenditures can represent up to 38% of total costs (Burns and Lee, 2008; Kim and Kwon, 2015).

In addition to SCM's broad impact on healthcare efficiency, physicians' influence in SCM and IM practices is well-documented. Studies show physicians, particularly surgeons, often play a decisive role in inventory-related decisions by requesting specific items or brands for clinical use (Boonstra et al., 2008; Currie et al., 2015; De Vries, 2011). Their authority and preferences introduce complexity to IM practices and hinder standardization efforts, as they may demand particular brands or devices that suit their clinical experience (Sun, 2021; Walley, 2013). This influence highlights how stakeholder power dynamics can impact SCM outcomes, especially in settings where clinical demands and hospital logistics intersect (Kumar et al., 2022; Hussain and Cornelius, 2009).

The Information Systems (IS) literature also provides insights into physicians' responses to technology adoption and SCM practices. Physicians' perceptions of technology's utility or threats significantly affect their acceptance or resistance to SCM and IM systems in hospital environments (Hu et al., 1999; Liu and Cheng, 2016; Paré et al., 2006). By examining technology adoption behaviours, IS

studies help illuminate the attitudes and behaviours of physicians toward SCM initiatives, offering perspectives on enhancing acceptance of SCM practices within clinical settings. IS insights are particularly relevant for understanding resistance or acceptance toward technologies that standardize or automate hospital inventory systems, an area in which physicians' alignment or misalignment with SCM goals can impact the overall effectiveness of these systems (Lux and Petit, 2016; Schlichter and Rose, 2013).

Furthermore, the organisational and environmental contexts within hospitals strongly influence the dynamics between physicians and SCM, as this thesis proposes. As noted by scholars, contextual factors such as hospital funding structures, the employment model of physicians, and organisational governance impact how SCM practices are adopted and how power dynamics unfold (Aptel and Pourjalali, 2001; Callen et al., 2007; Islamoglu and Liebenau, 2007). For instance, hospitals with a higher ratio of hospital-based physicians tend to exhibit more substantial alignment with SCM objectives and achieve better logistics performance (Nyaga et al., 2015). However, variations in funding (e.g., public vs. private) and administrative autonomy create diverse outcomes in how hospitals implement and adapt SCM practices (Aptel and Pourjalali, 2001).

Despite substantial research, gaps remain in understanding how these organisational and environmental contexts impact physicians' influence within SCM and IM practices. Literature in this area often overlooks the influence of context, which shapes how physicians negotiate their power and preferences within hospital SCM (Chang et al., 2007; Jensen and Aanestad, 2007; Peltokorpi et al., 2008). In particular, few studies address how organisational arrangements, such as physician contracts and public versus private funding, modulate power dynamics and SCM practices within healthcare institutions (DiMaggio and Powell, 1983; Jones and Wooldridge, 2016). Resource Dependency Theory (Pfeffer and Salancik, 1978) suggests that organisations rely on key stakeholders and resources to achieve their objectives, creating power dynamics that directly impact SCM practices, mainly IM. However, understanding how these dependencies shape IM practices within healthcare SCM – primarily through

physicians' influence over critical inventory decisions – remains an underexplored area.

This thesis systematically examines the influence of contextual factors on IM practices within hospitals, focusing on the role of physicians and addressing a knowledge gap. Using a systematic literature review approach (Tranfield et al., 2003), 88 relevant studies were selected to develop an understanding of physicians' influence on IM practices. This review reveals a striking lack of studies that explore how environmental and organisational contexts influence power dynamics in IM, particularly concerning physician engagement in IM decisions. This gap highlights a significant research opportunity to examine how contextual factors shape the effectiveness and adaptation of IM within healthcare settings, particularly as they relate to managing high-stakes items in surgical settings and beyond.

1.3 Research Questions

As highlighted earlier, this doctoral thesis explores the intricate interplay between organisational and environmental contexts and their influence on the dynamics of stakeholder power within hospital IM practices' (re)shaping. During the extensive literature review, two elements came in, each bearing significant implications for this study.

The first element, situated at the organisational level, draws from Nyaga et al.'s (2015) empirical work, revealing a positive correlation between hospital-based physician ratio and hospital logistics efficiency (Nyaga et al., 2015). The second element at the environmental level delves into the hospital's funding orientation, explicitly distinguishing between public and private sources (Aptel and Pourjalali, 2001; Issahaku et al., 2021).

From the array of SCM practices in the hospital setting, this study narrows its focus to IM within the Operating Theatres (OTs). Several factors validate this selection. Firstly, the literature concerning IM within OTs remains notably limited, even though this clinical area accounts for a substantial portion, approximately 60%, of a hospital's overall costs (Ahmadi et al., 2018).

Secondly, IM practices within OTs are characterised by their complexity, involving assembling a diverse set of Stock Keeping Units (SKUs) to create surgical kits tailored to individual patient characteristics, surgical procedures, and surgeon preferences (Stockert and Langerman, 2014). Standardising these kits is a formidable challenge, contingent upon many factors, including the surgeon's clinical judgment, patient health conditions, and available supplies within the OT (Montgomery and Schneller, 2007; Rappold et al., 2011; Rosenstein, 2004).

Additionally, existing literature contends that the influence of certain physicians, particularly specialists such as surgeons, is considerably stronger (Abernethy and Vagnoni, 2004), indicating complex power dynamics in the selection of the physician preference items (PPI) challenging to determine medical equivalence with other similar products, adding more pressure to the IM practices (Lawrie et al., 2022).

Considering these observations and recognising the existing gaps in the literature, this research endeavour seeks to construct a novel framework that elucidates the role of contextual factors and power dynamics in shaping supply chain practices within hospital OTs. Also, building upon the insights of De Vries's (2011) framework, this study aims to explore how an environmental context like the hospital's funding orientation (public or private) and an organisational context like the type of contract held by surgeons (re)shape IM practices in the OT. Consequently, this study posits the following research questions (RQ)

RQ1: *How does the funding orientation of a hospital (private or public) sway the surgeon's influence in the inventory system at the OT?*

RQ2: *How does the hospital's contract arrangement (hospital-based or non-hospital-based) sway the surgeon's influence in the inventory system at the OT?*

These research questions serve as the foundational pillars upon which this thesis is constructed, aiming to contribute valuable insights to the broader discourse surrounding hospital SCM practices and the pivotal role played by physicians within them.

1.4 Methodology

Research methodology is an indispensable component of any scholarly investigation. Ensuring validity, reliability, and transparency is crucial for conducting rigorous research (Eisenhardt, 1989). A qualitative deductive research strategy was followed, aligning with interpretivism as the research paradigm (Weber, 1964) and case study methods (Yin, 2018).

Furthermore, the study relies on observations, document analysis and interviews, wherein the author maintains a certain distance from the phenomenon under investigation. Simultaneously, the author embraces an outsider and learner role, wherein answers to the research questions emerge from a model constructed through an extensive literature review (Blaikie, 2007). However, the findings and discussions are grounded in the observations and analyses conducted through case study methods (Yin, 2018).

Case study methods were employed as the primary research approach (Yin, 2018), a trend in operations and supply chain management research (Ketokivi and Choi, 2014). Building upon De Vries' original work in 2011, which explored the influence of power and interests of stakeholders in the inventory system within healthcare organisations, this study seeks to expand this knowledge by investigating the impact of additional contextual elements and the conditions under which these relationships manifest. The research delves into how the physician's contract type and the hospital's funding orientation affect the influence of surgeons in the inventory system, enriching the De Vries (2011) model with the development of new elements.

The research employs a multiple case study approach (Yin, 2018), featuring four distinct case studies, each characterised by varying private/public funding orientations with contexts relating to hospital-based/non-hospital-based physician contracts. Multiple case study methods enable the exploration of differences and commonalities (Stake, 2006), facilitating a deeper understanding and enriching the existing literature (Milles et al., 2020).

This research endeavours to comprehend the socially constructed practices of IM, delving into the daily activities within this domain. It aligns with an interpretivism research paradigm (Blaikie, 2007), recognising that understanding social phenomena necessitates an appreciation of the social world as constructed and reproduced by individuals daily (Schutz, 1972; Weber, 1964). This paradigm assumes an "idealism" ontology (Potter, 1996) and a "constructionism" epistemology (Crotty, 1998), recognising multiple social realities shaped by contextual factors.

In summary, this research adopts a deductive research strategy (Popper, 1959) within an interpretivism paradigm (Blaikie, 2007) to explore how environmental and organisational contexts sway the surgeons' influence on hospitals' inventory systems. It utilises multiple case study methods (Yin, 2018) to examine the impact of contextual elements on power dynamics, delving into the motives and meanings of surgeons through interviews, observations and document analysis. This qualitative, exploratory approach is centred on understanding social phenomena in specific contexts and aligns with the "how" form of the research questions (Blaikie, 2007; Stake, 2006).

1.5 Contribution

1.5.1 Theoretical Contribution

This study makes several contributions to Theory. It supports the literature by recognising the influence of physicians in SCM practices (Boonstra et al., 2008; Cox et al., 2005; Montgomery and Schneller, 2007; De Vries, 2011). It makes a unique contribution to the domain of power dynamics (Mintzberg, 1983; Pfeffer, 1992; Pfeffer and Salancik, 1978) by merging organisational and environmental dimensions into contextual factors and, at the same time, making a bridge between Resource Dependency Theory (Mitchell et al., 1997; Pfeffer, 1992; Pfeffer and Salancik, 1978) and Stakeholder Theory (Freeman, 1984).

The literature review developed in Chapter 2 identifies the seminal papers and their theories in the Stakeholders Theory (Freeman, 1984) and Resource Dependency Theory (Pfeffer and Salancik, 1978). It also identifies and reviews

power dynamics influence in SCM and IS (Boonstra et al., 2008; Coombs et al., 1992; De Vries, 2011; Kumar et al., 2022), legitimacy and professionalism of physicians (Ahmadi et al., 2018; Freidson, 1999; Montgomery and Schneller, 2007; Tasselli, 2015), their sources of power (Abernethy and Vagnoni, 2004; Sulz et al., 2022), manifestations of power (Cox et al., 2005; Doolin, 2004) and alternatives for counter measuring and dealing with power dynamics (Lux and Petit, 2016; Montgomery and Schneller, 2007; Rosenstein, 2004).

This study extends the knowledge about contextual factors influencing stakeholders' power and interests in shaping IM practices (re) (Boonstra et al., 2008; De Vries, 2011). It identifies environmental contextual factors like the hospital's funding system (Aptel and Pourjalali, 2001; Issahaku et al., 2021) and organisational factors like the hospital physician's contract type (Nyaga et al., 2015). This research also highlights the IM practices influenced by surgeons in the observed OT, which are well-documented in the IM literature, including inventory tracking and replenishment (Çakıcı et al., 2011; Bendavid et al., 2010; Rosales et al., 2014), Vendor Managed Inventory – VMI (Bhakoo et al., 2012; Krichanchai and MacCarthy, 2017; Matopoulos and Michailidou, 2013), planning and control systems (Budgett et al., 2017; Dellaert and van de Poel, 1996; Bijvank and Vis, 2012; Opolon, 2010), as well as the standardization and aggregation of SKUs (Askfors and Fornstedt, 2018; Beaulieu and Lehoux, 2018; Bjørn et al., 2009; Cox et al., 2005; Montgomery and Schneller, 2007; Nicholson et al., 2004; Olson et al., 2013; Rosenstein, 2004).

1.5.2 Practical Contribution

“Transforming knowledge into action” – Cranfield University's ethos

The difficulty of implementing, changing, or improving IM practices and, therefore, IM performance is of utter importance to IM and hospital managers in Healthcare settings and the pharmaceutical and medical devices industry. This research contributes to understanding surgeons' power and influence on IM practices (re)shaping within the Healthcare SC.

Firstly, hospital IM practitioners will benefit because the theoretical model allows them to handle different power dynamics depending on environmental and organisational contexts. Furthermore, hospital managers will have new lenses for planning and executing the adoption of IM practices or projects.

Secondly, Policymakers can leverage the insights from this research to design regulations that consider various implementation approaches within healthcare IM. This approach aligns with the imperative of managing rising healthcare costs whilst capitalising on the significant potential savings offered by effective IM practices (Burns, 2008; Rosenstein, 2004), improving patient quality issues (Verleye et al., 2017).

This thesis provides practical insights into the selling processes of pharmaceutical, medical device, and technology companies. Organisations can enhance their fulfilment levels by drawing upon power theories elucidated in the literature review.

Finally, entrepreneurs in the healthcare sector can utilise this research as a guiding compass. With ample room for improvement in healthcare Supply Chain Management (HCSCM) practices, this thesis is a valuable resource for translating academic knowledge into actionable strategies. Startups and new ventures can leverage these insights to engage effectively with hospital managers, physicians, and supply chain personnel, facilitating the sale and implementation of innovative ideas.

This thesis offers theoretical contributions and illustrates the practical applications of these principles. The author's experience with Novatecnica, a new startup in Colombia focused on improving internal HCSCM, highlights the tangible impact of this research. Inspired by this thesis's literature review and findings, Novatecnica gained the trust of medical institutions, created over 230 jobs, and achieved significant sales in 2023. Novatecnica, part of the Amarey Group, was founded during the author's tenure as Chief Operating Officer (COO) from 2012 to 2016 and Chief Executive Officer (CEO) from 2016 to 2021. The company is now one of the largest and most respected distributors of pharmaceuticals and medical devices in Colombia, Panama, and Costa Rica.

This thesis was the cornerstone for Novatecnica’s innovative hospital logistics business model. This practical success story underscores the potential for meaningful change in HCSCM practices driven by academic insights.

1.6 Navigating the Thesis

The following table presents a description of the seven chapters of the thesis with the key points and respective pages.

Table 1-1 Navigating the Thesis.

Chapter	Content	Key Points	Page
1	Introduction	It overviews the thesis, significance, research methodology, and contributions to academia and practice.	1-14
2	Literature Review	Summarises the Systematic Literature Review (SLR) process and outlines the research questions (RQ1 and RQ2) used in the study. RQ1: How does the funding orientation of a hospital (private or public) sway the surgeon's influence in the inventory system at the OT? RQ2: How does the hospital's contract type (hospital-based or non-hospital-based) sway the surgeon's influence in the inventory system at the OT?	15-63
3	Methodology	It describes the systematic literature review methods, the interpretivism research paradigm, the deductive research strategy, the idealist ontology, and the constructivist epistemology. It uses case study research methods and explains the coding process, semi-structured interview questionnaires, and sources as the deductive research strategy.	64-86
4	Data Collection and Analysis Methods	It describes the data collection from four case studies and 20 interviews with key stakeholders, including surgeons, logisticians and C-level. It presents a section about the Colombian healthcare landscape where the research took place.	87-123
5	Findings	It presents the findings, highlighting differences and similarities among the case studies. It introduces the power and interests of cross-case analysis, considering organisational and environmental contexts.	124-176
6	Discussion	It compares and critiques research findings with existing literature. It develops a theoretical model to analyse power dynamics in SCM and IS practices utilizing two theoretical lenses to interpret findings.	177-193
7	Contributions, conclusions and further research	It states this thesis's theoretical and practical contributions and concludes contextual factors' impact on physician power dynamics. It mentions the limitations of the thesis and proposes further research.	194-226

References	Lists all cited sources following the relevant citation style.	227-243
Appendices	Includes additional materials, if necessary.	245-287

Source: The author

2 LITERATURE REVIEW

“Real knowledge is to know the extent of one’s ignorance” Confucio.

This chapter aims to conduct a comprehensive systematic literature review (SLR) regarding physicians' influence on healthcare Supply Chain Management (SCM) and information systems (IS). Furthermore, it aims to provide an overview of the status of research in this field, highlighting seminal works, identifying gaps in the literature from individual, organisational, and contextual perspectives, and exploring the theoretical background in depth. Additionally, this chapter outlines how the research questions for this doctoral thesis were derived, paving the way for further investigations in this area of study. On the other hand, Section 2.1 explains the SLR methodology and appraisal process for the theory search, selection, and analysis of the literature.

2.1 Systematic Literature Review (SLR) Methodology

This section offers a detailed insight into the systematic literature review's methodology (Denyer and Tranfield, 2009). The study begins with the author exploring the IM domain in healthcare to contextualize the research (Section 2.2), followed by the systematic literature review in Section 2.3.

The subsequent sections of this chapter explain the literature domain selection. These domains intertwine, positioning the research at the confluence of healthcare institutions' SCM practices, power dynamics, and the influence of physicians. This chapter outlines the process for formulating the review question, a compass that guides the SLR (Tranfield et al., 2003). As the narrative unfolds, this chapter delves into the search process, elucidating where the author sourced relevant studies and the criteria for their inclusion. It also explains the methodology used for the initial selection and rigorous evaluation of these studies and its quality appraisal process (Wallace and Wray, 2006).

The methodology of the SLR follows the structured and comprehensive approach outlined by Tranfield et al. (2003). This review process in the SLR ensures

methodological rigour, validity and transparency (Tranfield et al., 2003). It distinguishes itself from traditional narrative reviews by adhering to a replicable and scientific procedure, striving to minimize bias through exhaustive literature searches encompassing academic studies (Denyer and Tranfield, 2009).

This section provides the framework for conducting the SLR. By applying the structured stages and transparency of the Tranfield et al. (2003) approach, this thesis aims to conduct a literature review that is methodologically rigorous and contextually relevant, enhancing the study's validity and making a meaningful contribution to the field.

2.1.1 Positioning of the Study

Initial insights into the dynamics of IM within healthcare institutions arose from the author's practitioner knowledge. A notable variation in IM performance across different hospitals became evident during the author's frequent visits to his customers as a practitioner. This was accompanied by a lack of understanding among hospital staff regarding these disparities. Furthermore, during on-site visits to healthcare facilities, IM personnel voiced concerns about the challenges posed by physicians' influence in reshaping internal inventory systems. This phenomenon bore substantial implications for institutions' financial viability and the availability of critical medical supplies, a matter of utmost significance in the healthcare sector (Cox et al., 2005; Jarrett, 1998).

In pursuit of a deeper understanding of these intricate dynamics, the author embarked on an academic journey exploring hospital IM practices. One of the articles reviewed in this stage was by De Vries (2011), where he studied the complex influence of stakeholders in healthcare inventory systems. The author meticulously constructed a refined search string to capture the essence of stakeholder influence. The theoretical foundations of two organisational theories, the ST and RDT, further informed the selection of keywords within the string.

The resultant search string, String 1, encompassed keywords and phrases essential for capturing the intricate web of physicians' dynamics, power structures, and interests.

('Power' OR 'Politics' OR 'Stakeholder influence' OR 'Resource dependency' OR 'interest*' OR 'physician* influence' OR 'adoption' OR 'governance')*

Simultaneously, the healthcare domain emerged as the second fundamental domain of inquiry. The research focuses primarily on hospitals, where the internal supply chain is the weak spot and more opportunities to improve performance exist (Rivard-Royer et al., 2002). Drawing from the literature on the legitimacy of physicians (Currie and Brown, 1997; Freidson, 1999; Lawrie et al., 2022; Pouloudi, 1999; Starr, 1982; Tasselli, 2015), it became evident that surgeons, in particular, wielded significant power within hospitals, especially within the context of surgery or operating theatres (OT). Consequently, String 2 encompassed keywords that encapsulated the hospital environment and surgical settings:

('Hospital' OR 'healthcare' OR 'health care' OR 'health services' OR 'surgery' OR 'clinic*' OR 'operati* theatre' OR 'operati* room')*

Recognizing the importance of SCM practices, the author sought to explore the complex domain of healthcare SC. Drawing on various definitions of SCM (Christopher, 2000; Christopher, 2016; De Vries, 2005; Lambert, 2000; Schneller and Smeltzer, 2006), the author expanded the search to include different elements of SCM elements, such as demand management, sourcing and purchasing, inventory management, and information systems.

The SLR was not limited to inventory management but incorporated insights from SCM and information systems. This broad perspective was important to capture how information systems and other SCM elements can influence practices in healthcare. Moreover, it revealed the significant role of physicians in shaping SCM practices, which, whilst relevant to the study, is explored in more detail in later chapters that focus on the IM domain. The string used for this search is as follows:

('supply chain management' OR 'inventory management' OR 'operation management' OR 'project management' OR 'information system*' OR 'information management' OR 'technology management' OR 'Inventory management' OR 'inventory control*' OR 'inventory system*' OR 'material**

management' OR 'material control*' OR 'material* logistic*' OR 'stock management' OR 'stock control*' OR 'demand management' OR 'demand control*' OR 'logistic* management' OR 'procurement' OR 'vendor managed inventory' OR 'VMI')*

The three domains that position this study are described in Figure 2-1, and their respective search strings are shown in Table 2-1.

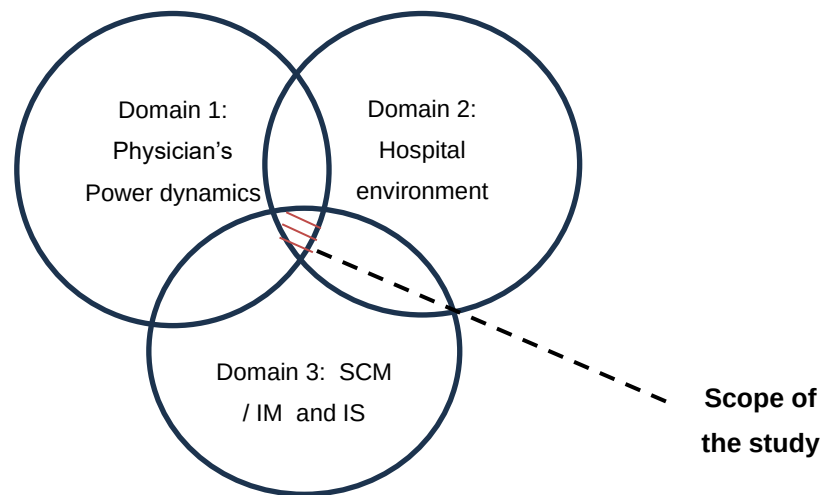


Figure 2-1 Scoping the study in literature domains

Source: The author

Table 2-1 Literature Domains and its strings.

Literature Domain	Search string
String 1 Physicians' influence	("Power" OR "Politics" OR "Stakeholder* influence" OR "Resource dependency" OR "interest*" OR "physician* influence" OR "adoption" OR "governance")
String 2 (HC)	("Hospital*" OR "healthcare" OR "health care" OR "health services" OR "surgery" OR "clinic*" OR "operati* theatre" OR "operati* room")
String 3 SCM, IM, IS	("supply chain management" OR "inventory management" OR "operation* management" OR "project management" OR "information system*" OR "information management" OR "technology management" OR "Inventory management" OR "inventory control*" OR "inventory system*" OR "material* management" OR "material* control*" OR "material* logistic*" OR "stock management" OR "stock control*" OR "demand management" OR "demand control*" OR "logistic* management" OR "procurement" OR "vendor managed inventory" OR "VMI")

Source: The author

2.1.2 The Review Question formulation

Intrigued and motivated by an intellectual desire to comprehend the influence of stakeholders, particularly physicians, on Inventory Management (IM), Supply Chain Management (SCM) and Information Systems (IS) practices and projects within hospital settings, this section presents the process carried out in the formulation of the review question investigated in the literature review (Denyer and Tranfield, 2009).

The author's prior notions about the power some physicians exert in medical devices and pharmaceutical SCM decision-making processes. An examination of literature surrounding the legitimacy of physicians in healthcare (Freidson, 1999; Glouberman and Mintzberg, 2001; Mintzberg and Glouberman, 2001; Mintzberg, 2017; Starr, 1982; Tasselli, 2015) pointed out that medical professionalism and intricate bureaucracies created inherent complexities in healthcare management (Coombs et al., 1992). Thus, the first element of the review question was defined, focusing on physicians as influential stakeholders within the healthcare domain.

The second element included in the scope of the investigation was a preference for exploring the complex but weak internal supply chain dynamics within

hospitals (Rivard-Royer et al., 2002), excluding ambulatory or primary care services. This distinction was rooted in the understanding that hospitals of a certain complexity, such as general or acute care facilities, often witnessed heightened levels of physician power dynamics due to the intricacies inherent in their clinical expertise (Burns, 2008) and professional alliances (Freidson, 1999; Starr, 1982; Tasselli, 2015) in the specialists or clinical consultants like surgeons, radiologists, oncologists, among others (Lawrie et al., 2022; Rosenstein, 2004).

A third element came from the Information Systems (IS) literature in which the implementation of certain information, data or technology projects could enrich the literature review and the influence of physicians in the IS domain (Boonstra et al., 2008)

The review question that integrated these three elements was: *How do stakeholders exert influence in the framing or reframing SCM, IM or IS practices and projects within hospitals?*

2.1.3 Locating studies

The search was conducted using ABI/ProQuest and EBSCO databases since these two databases are focused on business and management, including IM, SCM and IS. Their academic articles adopt the lenses of organisational theories, which the author aims to use to understand the phenomena.

Furthermore, the references included within the literature results derived from the systematic literature review process served as a valuable source of additional studies, and nine articles were included, not sought systematically but as cross-referenced articles from the SLR. This process is depicted in Figure 2-2 in next section 2.1.4.

2.1.4 Study selection and evaluation

This section explains the inclusion and exclusion criteria for the SLR to clarify the selection process of relevant studies. These criteria serve as a comprehensive guide to determine which articles were included or excluded in the review (Wallace and Wray, 2006). It is essential to establish these parameters to ensure

that the selected studies align with the research objectives and maintain the integrity and relevance of the review (Tranfield et al., 2003).

The initial phase involved querying the selected databases, EBSCO and ABI/INFORM, employing the three search strings in Table 2-1. The search yielded 4,559 potentially relevant articles after eliminating duplicate entries, as shown in Figure 2-2. Subsequently, an abstract and title screening was conducted to confirm the alignment of articles with the research's focus on power dynamics among physicians within hospitals.

Following this screening process, the list was trimmed to 265 articles. A comprehensive full-text screening ensued, where the author thoroughly applied the inclusion and exclusion criteria, summarized in Table 2-2. which offers a structured overview, making it easier to discern the factors that influenced the composition of the reviewed literature. This step led to a further reduction, leaving 80 articles for an in-depth review.

Table 2-2 Inclusion and exclusion criteria for the systematic literature review

Criteria	Inclusion Parameters	Exclusion Parameters	Justification
Language	English	Articles in languages other than English	It aligns with the international accessibility of English-language publications.
Article Characteristics	Peer-reviewed articles, Journal articles, Full-text articles		Peer-reviewed journal articles with full text provide reliable, comprehensive, and credible sources for the systematic literature review, ensuring the quality and depth of analysis.
Stakeholders Type	Articles featuring physicians as significant characters in the research	Articles where nurses, government, and IS departments are the primary focus and physicians, do not have a prominent role.	Physicians play a pivotal role in influencing healthcare SCM / IS practices, and focusing on their influence ensures the alignment of the review with the research objectives.
Supply Chain focus	Focus on the internal supply chain within hospitals, the weak link and where less research is done (Jarrett, 1998; Rivard-Royer, Landry. and Beaulieu, 2002)	Studies related to the external supply chain, like wholesalers, distributors, makers, or homecare links, were excluded.	The internal supply chain within hospitals is this research's primary area of interest, given its complexity and impact on SCM / IS practices, making it the review's focus.

Criteria	Inclusion Parameters	Exclusion Parameters	Justification
Hospital Type	Acute and general hospitals (tertiary and quaternary hospitals).	Primary care, ambulatory hospital services, home care, and nursing homes type of hospitals.	Tertiary and quaternary hospitals with complex supply chain arrangements are more likely to have significant physician influence, aligning with the research focus.
Topics	NA	Exclusion of literature related to Humanitarian relief and Public Policy in Healthcare. Knowledge management, knowledge sharing, and radical innovations were not included.	The exclusion of unrelated topics ensures that the review focuses on physician influence in SCM practices within hospitals, eliminating potential sources of bias.
Discipline	NA	Medical studies not mixed with management studies or organisational theories were excluded.	Excluding medical studies ensures that the selected literature aligns with the context of IM, SCM, and IS research, preventing overlap with unrelated medical disciplines.
Other Categories	NA	Articles related to Power and Energy Management or Power Business Intelligence tools that fall outside the scope of this research were excluded.	Articles related to power management and Business Intelligence tools do not contribute to the research objectives and may introduce unrelated concepts, justifying their exclusion.

Source: The author

Furthermore, examining cross-references in the initially selected articles (81 articles) led to 9 additional cross-referenced articles (See Appendix C) for 90 articles. After applying the quality appraisal framework (See Appendices A and B), two articles were removed (see Appendix D), with the final list comprising 88. The quality appraisal framework aligns with the objectives of a Doctor of Business Administration (DBA) thesis, emphasising results in terms of theoretical and practical contributions. This approach verifies the articles' theoretical underpinnings, the robustness of their methodologies, and their findings and contributions in both theoretical and practical dimensions (Pittaway et al., 2004).

These 88 articles underwent a comprehensive study and review involving data extraction to gain insights into the research question, theoretical foundations, findings, methodologies employed, and their theoretical and practical

contributions (See Appendix E). The data extraction format, detailed in Appendix G, is based on the quality appraisal framework outlined in Appendix A and includes ten completed examples. The SLR process, as outlined by Denyer and Tranfield (2009), is described below in Figure 2-2. Descriptive data, such as publications per year and the principal journals, can be found in Appendix F.

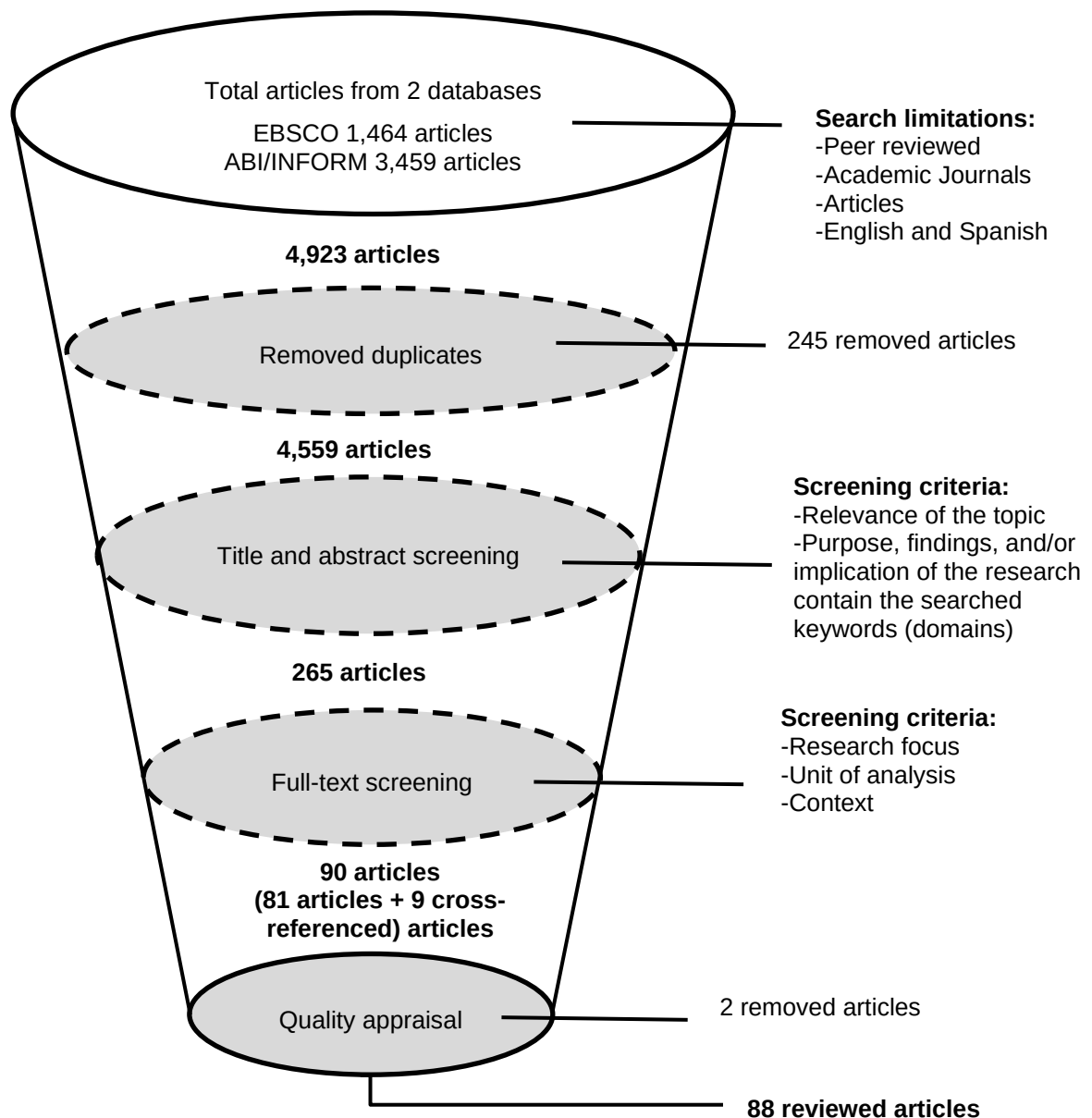


Figure 2-2 Article review protocol

Source: The author

2.2 IM practices background

IM within SCM involves various practices that ensure the proper supplies are available at the right time, balancing cost control with clinical requirements (Gebicki et al., 2014; Volland et al., 2017; De Vries, 2011). Among these practices, inventory tracking and replenishment are foundational to effective SCM in hospitals, especially for managing critical supplies such as pharmaceuticals and high-cost surgical devices (Çakıcı et al., 2011; Hornyak et al., 2016). Efficient tracking systems ensure that supplies are consistently available when needed, supporting patient care and reducing operational interruptions (Christopher, 2000; Lambert et al., 1998). IM in healthcare is particularly complex due to the variable and often urgent demand patterns and the high stakes of stockouts, which can directly impact patient outcomes (Burns and Lee, 2008; Kim and Kwon, 2015). Several scholars have highlighted that effective tracking and replenishment practices minimize costs associated with stockouts and overstocking (McKone-Sweet et al., 2005; Volland et al., 2017). Hospitals often deploy various technological solutions, including barcode systems and, more recently, RFID, to track inventory with higher accuracy (Bendavid et al., 2010; Opolon, 2010). RFID has been particularly impactful, with research by Çakıcı et al. (2011) and Bendavid et al. (2010) showing that RFID systems can reduce inventory errors and variability, improve stock visibility, and allow for more dynamic replenishment models (Çakıcı et al., 2011; Rosales et al., 2014; Rosales et al., 2015).

In addition, VMI is another important SCM practice involving collaboration with suppliers to manage stock levels, reduce administrative burdens, and enhance inventory accuracy (Disney and Towill, 2003). Hospitals adopting VMI benefit from a streamlined procurement process, improved stock availability, and reduced carrying costs for non-critical items (Krichanchai and MacCarthy, 2017; Matopoulos and Michailidou, 2013). In healthcare, where the inventory includes high-turnover consumables and low-demand, high-cost items, VMI can be highly effective for managing consumables (Dacosta-Claro and Lapierre, 2003). This collaborative practice is especially valuable in ensuring the timely availability of routine supplies whilst allowing hospitals to focus on more critical aspects of SCM.

(Guimarães et al., 2013), such as managing specialized surgical inventory like the physicians' PPIs (Rosenstein, 2004). For instance, Matopoulos and Michailidou (2013) found that VMI could reduce stockouts and administrative costs, enhancing inventory control and supporting clinical needs. This model aligns with the broader goals of SCM in healthcare: balancing efficiency with high-quality patient care (Jarrett, 1998; Mintzberg and Glouberman, 2001; Towill and Christopher, 2005).

A key IM component is planning and control systems, which are central to hospital IM practices as they enable healthcare providers to anticipate demand and manage inventory in alignment with patient care needs (Volland et al., 2017; De Vries, 2011). These systems are vital for managing urgent and elective procedures, each with distinct supply requirements (Klundert et al., 2008; Lapierre and Ruiz, 2007). Hospitals frequently implement various replenishment policies, including periodic, continuous, and hybrid systems, to meet the demands of different departments (Bijvank and Vis, 2012; Dellaert and van de Poel, 1996; Duclos, 1993; Gebicki et al., 2014; Guerrero et al., 2013; Kelle et al., 2012; Little and Coughlan, 2008; Rosales et al., 2014; Rosales et al., 2015; Wilson et al., 2015). Hybrid models like two-bin Kanban systems, which combine periodic and continuous replenishment, have effectively met high-availability requirements for critical items whilst minimizing stock levels for routine items (Rosales et al., 2014; Rosales et al., 2015). The adoption of these systems aligns with SCM's core objective of ensuring consistent stock availability at optimal cost levels (Burns and Lee, 2008; Nicholson et al., 2004). Furthermore, technological advancements, including RFID, support these planning and control systems by enabling real-time tracking and more responsive replenishment strategies (Çakıcı et al., 2011; Opolon, 2010).

Finally, standardization and aggregation of SKUs play a vital role in optimizing IM practices in healthcare, where maintaining a balance between physicians' preferences and operational efficiency is crucial (Cox et al., 2005; Jayaraman et al., 2014; Montgomery and Schneller, 2007). As Nicholson et al. (2004) highlighted, standardisation allows hospitals to reduce SKU variety, simplifying

inventory processes and reducing costs. However, surgeon preferences often challenge standardisation, particularly regarding Physician Preference Items (PPIs) (Burns and Lee, 2008; Montgomery and Schneller, 2007). Aggregating SKUs is particularly relevant in healthcare, as hospitals manage thousands of items, many of which are high-value and require specialized handling to avoid spoilage or obsolescence (Volland et al., 2017). Standardization and SKU aggregation efforts align with the broader goals of SCM by ensuring that inventory practices are as efficient as possible, especially for high-turnover items in critical departments such as operating theatres (Cox et al., 2005; McKone-Sweet et al., 2005; Montgomery and Schneller, 2013). Montgomery and Schneller (2013) further emphasise the need for standardised approaches and identify that unifying product specifications and minimizing variability across hospitals lead to cost savings and enhanced supply chain efficiency, even as close collaboration with clinicians is required to balance efficiency with clinical autonomy. Despite the complexity, standardized approaches have proven effective, with some hospitals implementing them to achieve significant benefits in the IM domain (Bendavid et al., 2010; Çakıcı et al., 2011; Rosales et al., 2014).

2.3 IM performance

Inventory management (IM) in hospitals plays a crucial role in ensuring the timely availability of medical supplies whilst minimizing waste and operational costs (Volland et al., 2017). Given the growing volume and diversity of healthcare supplies, effective IM practices are essential for balancing inventory levels to avoid stockouts and overstocking (Burns et al., 2001; Gebicki et al., 2014). Hospitals face unique challenges due to the complexity of managing diverse and high-value inventories, particularly in high-demand areas such as Operating Theatres (OTs), where the timely availability of medical supplies is paramount to patient care (George and Elrashid, 2023; Burns et al., 2007). Key Performance Indicators (KPIs), including inventory turnover, accuracy, and stock availability, are essential metrics for assessing hospital IM performance (Rakovska and Stratieva, 2018). These performance metrics provide a quantitative measure of operational efficiency and are particularly significant in high-demand settings

such as OTs, where timely access to medical supplies directly affects operational and patient care outcomes (Klundert et al., 2008; Lapierre and Ruiz, 2007). Effective IM ensures hospitals meet their logistical objectives whilst maintaining high standards of patient care, especially in complex areas like surgery where precision and timely availability of supplies are critical (Lega et al., 2012; Rappold et al., 2011).

IM in hospitals is essential for ensuring the availability of medical supplies whilst minimizing excess inventory, directly influencing cost efficiency and patient care quality (Volland et al., 2017). Effective IM practices help hospitals balance inventory levels to prevent stockouts and avoid tying up unnecessary financial resources in overstocked items (Nicholson et al., 2004). Key Performance Indicators (KPIs) are commonly used to assess IM performance, providing insights into a hospital's operational efficiency (Moons et al., 2019). These KPIs often include inventory turnover, accuracy, and stock availability, which offer a quantitative view of how well a hospital manages its inventory (Rakovska and Stratieva, 2018). These performance indicators are critical for understanding how well hospitals align their logistical objectives with operational goals, ensuring that necessary supplies are available when needed whilst minimizing waste (Rivard-Royer et al., 2002).

A significant aspect of IM performance is inventory accuracy, which measures the reliability of inventory records (Moons et al., 2019). Accurate inventory tracking is crucial to maintaining stock levels that match the hospital's actual needs, avoiding the costs associated with overstocking or stockouts (Bendavid et al., 2010). Inaccurate records can lead to operational disruptions, such as surgery delays or unnecessary procurement, impacting costs and patient care (Kritchanchai et al., 2018). Many hospitals increasingly rely on technologies such as RFID and barcode scanning to improve inventory accuracy, reduce human error, and ensure real-time updates to inventory systems (Hornyak et al., 2016; Jayaraman et al., 2014). With high inventory accuracy, hospitals can forecast demand, improve procurement decisions, and enhance overall operational

efficiency (Bhakoo et al., 2012; George and Elrashid, 2023; Furukawa et al., 2008; Opolon, 2010).

Another important KPI in evaluating IM performance is inventory turnover, which measures how frequently inventory is used and replenished over a specific period (George and Elrashid, 2023; Rakovska and Stratieva, 2018). High turnover rates indicate that a hospital efficiently manages its inventory, reducing the amount of capital tied up in stock and ensuring that supplies are available when needed (Rosales et al., 2014; Rosales et al., 2015). Hospitals with high inventory turnover rates typically have well-integrated logistics and clinical teams, as coordinated demand forecasting can align procurement practices with clinical needs (Rappold et al., 2011). Efficient inventory turnover helps improve operational efficiency and supports cost-reduction efforts by minimizing the need for storage and decreasing the likelihood of obsolete or expired inventory (Bijvank and Vis, 2012; Dellaert and van de Poel, 1996). A high turnover rate is often associated with hospitals with streamlined systems and better demand management strategies, especially those that employ advanced IT solutions to track usage and automate replenishment processes (Hornyak et al., 2016; Rappold et al., 2011).

Visibility throughout the supply chain also influences IM performance (Rakovska and Stratieva, 2018). Real-time access to inventory data allows hospitals to respond promptly to supply shortages, optimise stock levels, and reduce waste (Krichanchai et al., 2018). The adoption of integrated information systems, such as Hospital Information Systems (HIS) or Enterprise Resource Planning (ERP) systems, provides enhanced visibility into inventory levels, enabling more accurate demand forecasting and more responsive supply chain management (Krichanchai et al., 2018). Hospitals that invest in these systems typically experience better coordination between departments, improving inventory management efficiency and ensuring that the right supplies are available at the right time (Furukawa et al., 2008), particularly in high-demand settings such as Operating Theatres (Güllü and Köksalan, 2013). Greater supply chain visibility

improves IM efficiency and supports better hospital decision-making by providing timely data on stock levels, usage trends, and future needs (Çakıcı et al., 2011).

Despite the importance of these IM performance indicators, challenges remain in integrating them effectively across hospital departments (Rosenstein, 2004). Many hospitals still face difficulties in aligning supply chain practices with the dynamic needs of clinical teams, particularly in environments where physicians have significant influence over procurement and inventory decisions (Cox et al., 2005; Schneller and Smeltzer, 2006). Hospitals operating under private funding models often experience greater efficiency in IM practices due to the pressures of cost control and competition, whilst public hospitals may face more constraints that impact their ability to optimise inventory management (Apter and Pourjalali, 2001; Rakovska and Stratieva, 2018). These contextual factors, such as the hospital's funding structure and the involvement of physicians in supply chain decisions, play a crucial role in determining the effectiveness of IM systems, which this thesis aims to explore.

In conclusion, IM performance in hospitals is driven by several key factors, including inventory accuracy, turnover, and visibility (Rakovska and Stratieva, 2018). These indicators provide valuable insights into the operational efficiency of hospitals, offering a framework for assessing and improving supply chain management practices (Moons et al., 2019). Whilst technological advancements and data integration are improving IM processes (Bendavid et al., 2010; Çakıcı et al., 2011), external factors such as funding models (Aptel and Pourjalali, 2001) and physician influence (Cox et al., 2005; Schneller and Smeltzer, 2006) must also be considered when developing strategies to enhance IM performance. Understanding and optimising these key performance metrics is crucial for hospitals aiming to improve operational efficiency, reduce costs, and deliver high-quality patient care (Moons et al., 2019; Rakovska and Stratieva, 2018; Volland et al., 2007).

2.4 Theoretical Background

In this section, the study delves into two prominent theories that play a central role in shaping the foundation of this thesis, providing insights to interpret the

research findings. The theories included are Resource Dependency Theory (RDT) and Stakeholder Theory (ST). By comprehensively presenting and understanding these theories, including their adaptation within the De Vries (2011) framework, the study establishes a solid foundation for analyzing relevant literature, gaining valuable perspectives, and shaping the subsequent discussions and analyses in this investigation.

Firstly, Resource Dependency Theory (RDT), as advocated by Pfeffer and Salancik (1978) and used as the cornerstone by De Vries (2011) in his power dynamics framework, serves as the foundational theory upon which this research is built. It focuses on the influence of external resources on an organisation, shedding light on power dynamics driven by the control of the resources, their dependence, and interdependence.

In addition, Stakeholder Theory (ST), developed by Freeman (1984), was incorporated into the theoretical model as a tool for better understanding the interests of various stakeholders within an organisation. ST is applied to examine the legitimacy of surgeons in the SCM system and the role that surgeons adopt as a response to the environmental and organisational contextual elements.

This thesis applied RDT embedded in the De Vries (2011) model and used ST as lenses to complement the understanding of the phenomena and explore the Research Questions (RQs). Therefore, this section describes the theoretical background for developing the methodology and comprehending the findings. The mentioned theories will guide the systematic literature review, ensuring coherence and rigour in this study."

2.4.1 The Resource Dependency Theory (RDT)

The Resource Dependency Theory (RDT), introduced by Pfeffer and Salancik (1978), posits that organisations rely on external resources, and their success and survival are contingent upon their ability to acquire and effectively manage these resources (Pfeffer and Salancik, 1978). This theory encompasses four fundamental concepts: resource acquisition, dependence, interdependence, and power.

Resource acquisition is a critical aspect of the RDT, emphasising the importance of organisations securing essential resources from their external environment (Pfeffer, 1992). In the context of HC organisations, physicians play a significant role in resource acquisition (Olson et al., 2013). Their expertise, skills, and professional networks are valuable resources for hospitals and healthcare facilities (Lux and Petit, 2016). By collaborating with physicians with specialised knowledge or skills, healthcare organisations can enhance their capacity to provide high-quality services and attract patients seeking specific medical expertise (Kumar et al., 2022). Moreover, physicians' professional affiliations and networks can facilitate partnerships and collaborations with other HC institutions, expanding the organisation's resource base (Papadopoulos and Merali, 2009). For instance, a surgeon forming alliances with other surgeons or hospitals can reduce dependency on a specific hospital or payer, promoting diversification of resources and increasing the organisation's resilience (Cox et al., 2005).

Resource dependence, another core concept of the theory, highlights how organisations' reliance on external resources can influence their behaviour and decision-making processes (Pfeffer and Salancik, 1978). Physicians often influence resource allocation and utilisation within hospitals and healthcare institutions (Coombs et al., 1992). Their decisions regarding medical equipment, supplies, and treatment protocols can affect the organisation's resource management (Ahmadi et al., 2018). Physicians' preferences and choices regarding specific medical technologies or treatment approaches may increase resource demands or expenditures (Olson et al., 2013). As a result, HC organisations must carefully consider physicians' input and preferences when making resource-related decisions to ensure the effective utilisation and management of resources (Rappold et al., 2011).

Interdependence, a core concept of the RDT, highlights the dynamic relationships between organisations and their external environment (Pfeffer and Salancik, 1978). In HC, interdependence is particularly pronounced in the patient-physician relationship (Hinterplattner and Staberhofer, 2016). Patients are key stakeholders whose HC decisions impact the resource demands and utilisation

within HC organisations (Kumar et al., 2022). The HC organisation's legitimacy is partly derived from the patient's perception that it provides quality care and meets their healthcare needs (Verleye et al., 2017). Therefore, HC organisations must establish positive patient relationships to secure patient trust and confidence in their services.

However, the RDT also reveals potential challenges in resource management within HC organisations. Physicians may have professional goals or priorities that diverge from the organisational objectives critical for maintaining the hospital's overall resource base (Beaulieu and Lehoux, 2018). This misalignment can lead to conflicting resource allocation decisions and hinder the organisation's ability to optimise resource utilisation (Boonstra et al., 2008; Derecho et al., 2024).

Moreover, hospital power dynamics can significantly influence resource allocation and management (De Vries, 2011). Regulatory requirements or pressures from payers to reduce costs may impact physicians' behaviour and actions, influencing their resource utilisation practices (Ahmadi et al., 2018; Vann Yaroson et al., 2023). Hence, understanding the intricate interplay between physicians, organisational goals, and resource dependency is crucial for effective resource management in HC organisations.

In conclusion, the RDT provides valuable insights into how organisations, including healthcare institutions, rely on external resources for success and survival (Hellström et al., 2010; Islamoglu and Liebenau, 2007; Lux and Petit, 2016). Physicians, as critical stakeholders in the healthcare domain, play a pivotal role in resource acquisition and management (Boonstra et al., 2008; Cox et al., 2005; De Vries, 2011). Their expertise, networks, and decision-making influence hospital resource allocation and utilisation (Abernethy and Vagnoni, 2004; Coombs et al., 1992; Doolin, 2004; Kumar et al., 2022). Nevertheless, the theory also underscores potential challenges related to resource management stemming from misaligned professional goals and power dynamics within healthcare organisations (Lux and Petit, 2016; De Vries, 2011).

2.4.2 The Stakeholder Theory (ST)

Stakeholder theory (ST) emphasises the significance of comprehending the interests and needs of the diverse stakeholder groups involved in an organisation (Freeman, 1984). Stakeholders encompass any group or individual who can be influenced or impacted by the decisions made by an organisation (Donaldson and Preston, 1995). In HC, stakeholders include patients, vendors, providers, physicians, nurses, payers, government agencies, and communities (Abernethy and Vagnoni, 2004). The theory highlights the importance of identifying and understanding stakeholders to create value and prioritize their diverse interests and needs within the healthcare environment (Walley, 2013).

ST states that value should be created for shareholders and stakeholders. In 1997, Mitchell et al. developed a framework for identifying and prioritising stakeholders based on power, legitimacy, and urgency. Power, according to ST, refers to the extent to which an individual or group can influence the behaviour or actions of an organisation. Power sources can be derived from legal authority, formal authority, knowledge and expertise, financial resources, or social relationships (Mitchell et al., 1997).

Legitimacy, conversely, relates to the perception that an individual or group is appropriate and acceptable to stakeholders (Mitchell et al., 1997). In HC, legitimacy can be derived from various sources, including adherence to social norms, compliance with legal or regulatory frameworks, and delivering high-quality services or products (Pouloudi, 1999). For HC organisations, the perception of legitimacy may arise from quality or patient safety certification, adherence to clinical guidelines, and the provision of evidence-based care (Walley, 2013). Legitimacy will be covered further in section 2.4.2 of this thesis.

In healthcare, specialists, like surgeons, are key stakeholders and subject to considerations of legitimacy (Serrano et al., 2020). Factors contributing to a surgeon's legitimacy may include their education and training, medical school and residency training, certifications, and specialised training like robotic-assisted surgery (Lawrie et al., 2022). Moreover, having professional credentials or

fellowships in prestigious medical associations can enhance a surgeon's legitimacy (Currie et al., 2015).

Additionally, a surgeon's professional reputation, built upon feedback from patients, peers, hospitals, or funders, is another crucial aspect of legitimacy (Boonstra et al., 2017; Pouloudi, 1999). Lastly, adherence to medical guidelines or protocols for ensuring quality care further bolsters a surgeon's legitimacy (Madhlambudzi and Papanagnou, 2019).

Understanding ST in healthcare is essential for comprehending the dynamics of physician influence within the SCM and IS domains. By identifying and prioritising stakeholders based on their power, legitimacy, and urgency (Mitchell et al., 1997), HC organisations can develop effective strategies to create value for these stakeholders and achieve a harmonious balance between their interests and hospital needs (Alkrajji et al., 2016; Jahangirian et al., 2015; Yang et al., 2015).

2.4.3 The De Vries (2011) model

This thesis is grounded in the theoretical framework proposed by De Vries in 2011, which investigates the intricate dynamics of stakeholder relationships and interactions in shaping a hospital's medicine inventory system. Central to De Vries's model is RDT, which posits that organisations must strategically manage relationships with key stakeholders to secure vital resources (Pfeffer and Salancik, 1978). By incorporating RDT (section 2.3.1) and ST principles (section 2.3.2), as articulated by Freeman (1984), De Vries's framework offers a comprehensive lens through which to analyze how the interdependencies among stakeholders—particularly physicians—affect IM practices within healthcare settings. This integrative approach highlights the importance of resource acquisition and management and underscores the significance of understanding stakeholders' power dynamics and interests that drive hospital decision-making processes.

De Vries' (2011) model explores the power dynamics and interests as forces in configuring a hospital's inventory system. However, it is imperative to consider that this (re)framing process can be influenced by many elements, with context

playing a significant role (Aptel and Pourjalali, 2001; Bjørn et al., 2009; Callen et al., 2007; Chang et al., 2007; Shaw et al., 2011; Shrivastava et al., 2023). In this approach, context comprises the broader environment in which the hospital operates and the organisational traits that impact the culture and norms of the institution. Understanding contextual factors is crucial for developing this thesis and the De Vries (2011) model. Moreover, Nyaga et al. (2015) and Issahaku (2021) have explored how specific contextual elements, such as physicians' contract relationship with the hospital and the funding orientation of the HC organisation, can significantly shape the application of De Vries' framework (Issahaku et al., 2021; Nyaga et al., 2015) and are explained in the next section 2.4.

De Vries' (2011) research model, as illustrated in Figure 2-3, was developed to illustrate the relationships among diverse stakeholders within a hospital's inventory system. The central question that guided his research was understanding the precise influence different stakeholders had over the outcomes of a pharmaceutical inventory reshaping process. To investigate this question, he conducted an exploratory case study focusing on an inventory project to analyze and improve the pharmaceutical inventory system's performance within a hospital.

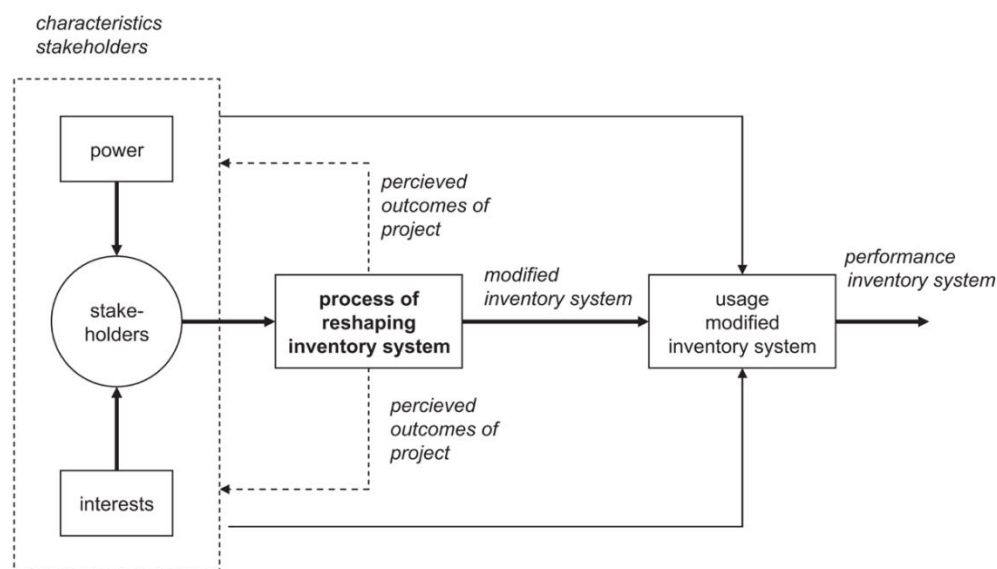


Figure 2-3 De Vries's (2011) research model

Source: Reproduced from De Vries (2011)

This study highlights the role of project managers within the inventory management field. They must oversee the technical aspects and handle the power dynamics of stakeholder relationships. It stresses how multiple stakeholders with unique objectives and interests can significantly impact the project's outcomes. Stakeholders' power dynamics and interests come into play when determining crucial factors like storage levels, locations, information analysis processes, and decision-making authority. Throughout the inventory management project, the original configuration underwent continuous adjustments based on stakeholders' perceptions of inventory outcomes, reframing the original SCM project.

De Vries (2011) identified contingency factors contributing to reshaping hospital inventory systems. These include top management support and policy, project management effectiveness, and the distinctive healthcare delivery setting. Initially, top management support was robust but gradually decreased over time. This shift was characterized by a turn toward prioritizing elements related to patient care over logistics goals, a conflict explored in section 2.4. De Vries (2011) pointed out deficiencies in methods and IM knowledge in project management. Ultimately, decision-making processes were significantly biased by medical considerations. Medical professionals assumed central roles in shaping these outcomes.

De Vries' (2011) model is embedded in the RDT. The RDT posits that an organisation's viability depends on managing external interest groups that provide external resources. De Vries (2011) extends this theory into HC IM, emphasising power dynamics' role in resource allocation and management. This dynamic interplay of power, resources, and interests reframes the hospital's inventory system. His work highlights the need for a more comprehensive SCM approach that integrates technical proficiency with a keen understanding of stakeholder dynamics and contextual traits. This study addresses a gap in the literature by incorporating contextual factors, which De Vries (2011) did not consider.

2.4.4 Other Theories

Whilst this thesis mainly relies on the RDT and ST to investigate the influence of contextual factors on physicians' power dynamics within hospital IM, Agency and Stewardship theory are used in the organisational contextual element and are explained in this section with other theories embedded in the literature of the SLR. They are briefly summarised in this section, and at the end, Tables 2-1 indicate why they have not been incorporated and the relationship with some of the objectives of the two theories explained above (RDT and ST).

To begin with, the Theory of Reasoned Action, developed by Fishbein and Ajzen (1975), provides a foundational framework for understanding how individual behaviours are formed based on their intentions. The theory posits that an individual's intention to perform a behaviour is the most significant predictor of actual behaviour, and this intention is influenced by their attitude toward the behaviour and the subjective norms surrounding it. Specifically, attitudes are shaped by the perceived outcomes of the behaviour, whilst subjective norms involve the influence of peers and social expectations (Sheng et al., 1998). In the context of HCSCM, understanding physicians' behaviour can illuminate how their attitudes and perceptions about SCM practices might influence their decisions. However, this thesis emphasizes that the interaction between contextual factors, such as organisational structure and environmental traits, plays a more critical role in shaping these behaviours than individual attitudes alone. Consequently, whilst the Theory of Reasoned Action offers valuable insights into individual decision-making, it fails to address the broader systemic issues that influence physician behaviour within the HCSC (Liu and Cheng, 2016; Luo et al., 2024; Walter and Lopez, 2008). Thus, the focus shifts towards RDT and ST, which better capture the complexities of the relationships and dependencies that characterize the interactions between key stakeholders in healthcare settings.

Another relevant theory found in the SLR is the Institutional Theory, articulated by Meyer and Rowan (1977). It explores how organisations are influenced by the institutional contexts in which they operate, including the norms, regulations, and

cultural expectations that shape their behaviours and practices. This theory emphasizes the concept of isomorphism, which suggests that organisations within the same field tend to become more similar over time due to coercive, normative, and mimetic pressures (Jensen et al., 2009). In the healthcare sector, these pressures can significantly impact how hospitals and healthcare providers design their operational practices and organisational structures to align with external expectations (Jones and Wooldridge, 2016). Although Institutional Theory provides a useful lens for understanding these dynamics, this thesis aims explicitly to focus on the power dynamics between physicians and healthcare organisations rather than the broader institutional pressures that shape these relationships. By excluding this theory from the primary theoretical framework, the research centres on RDT and ST, facilitating a more detailed analysis of how physicians' interests and influence directly affect SCM and IM practices. This targeted approach allows for a richer exploration of the interdependencies within HCSC, emphasizing the importance of stakeholder interactions in shaping organisational outcomes.

In addition, the Agency theory, developed by Jensen and Meckling (1976), explains the principal-agent relationships and conflicts of interest with the Agency; in the thesis, the agent is the surgeon, and the agency is the hospital. Although not explicitly employed, agency theory is the basis for examining power dynamics among healthcare stakeholders, particularly physicians and hospital managers, implicitly informing the analysis of power and decision-making processes. Therefore, the author considered that RDT power dynamics share part of the explanatory power of the agency theory.

On the other hand, the Stewardship Theory, introduced by Donaldson and Davis in 1989, suggests that entrusted individuals act as responsible stewards of an organisation's resources. Though not the primary theory, it provides insights into the behaviour of stakeholders, such as physicians, who may act as stewards of hospital supply chain resources, aligning with the research's exploration of physician behaviour and power dynamics. These two theories are used to describe the organisational context in Nyaga et al.'s (2015) paper, which analyses

physicians' hospital-based (stewardship theory) and non-hospital-based (agency theory) and the impact on some SCM practices.

Moreover, the Technology-Organisation-Environment (TOE) framework, formulated initially by Tornatzky and Fleischer (1990), provides a structured perspective for comprehending the adoption and implementation of technological innovations within organisations. Whilst not the central focus, the TOE framework informs this research by highlighting the interplay between technology, organisational structure, and the external environment, indirectly contributing to the analysis of how technology adoption can shape power dynamics in healthcare SCM. TOE articles are described in, and part of what the RDT explains is in the core of the articles and used to enrich organisational and environmental contextual factors. Furthermore, contingency factors frameworks encompass internal and external conditions impacting organisations and serve as a context for analysing power dynamics in hospital SCM. These factors indirectly contribute to understanding how contextual elements influence power concepts and their implications for SCM practices.

Similarly, Structuration Theory, developed by Anthony Giddens, explores the interplay between individual actions and social structures (Giddens, 1984). Whilst not directly applied, this theory enhances the understanding of power dynamics by acknowledging how individual actions shape and are shaped by power structures within SCM practices in hospitals. Explanatory power aim is shared with the RDT and, therefore, was not included in an extensive analysis. Furthermore, another theory in the SLR is the Actor-network theory (ANT), which examines relationships among human and non-human actors (Latour, 1999). Though not a central theory, ANT offers a unique perspective on the intricate interactions and power dynamics among various actors in healthcare SCM, enriching the analysis of how actors and technologies influence decision-making processes. The explanatory power aim is shared with the RDT and ST and, therefore, was not included in the thesis.

2.4.5 Theory Overview

The author's thorough literature analysis provided the thesis with a solid theoretical background, framed by two fundamental theories: RDT as the main theory and ST as the complementary lenses, complementing and enriching the investigation. Table 2-3 outlines the theoretical framework employed in this study, whilst Table 2-4 presents a systematic categorization of the 88 articles selected and rigorously examined during the literature review for this thesis.

Table 2-3 Theoretical Overview

Theory	How is it related to the research?	How is it incorporated?	Level of analysis
Stakeholder Theory (ST) (Freeman, 1984)	It explains the interests and power of stakeholders. It also develops definitions of power and the concepts of legitimacy and urgency. It also notes that power sources and legitimacy are among them.	The thesis is interested in understanding the interests of physicians and the sources of power. Understanding the sources of legitimacy and when legitimacy leads to power is also developed in RDT. In legitimacy, another stakeholder, the patient, appears as a source. The legitimate interests of stakeholders, depending on whether the context increases or changes, are used in Chapter 4.	Individual - Organisational
Resource Dependency Theory (RDT) (Pfeffer and Salancik, 1978)	Organisations depend on external resources, and their control is decisive in their interaction with power. The four components of RDT are resource acquisition, dependence, interdependence, and power. It also defines Power and states that it exists due to the interdependence between different members and units in the organisation for controlling external resources depending on it through exercising power.	The model uses the power definitions used in Chapter 4, which is the potential ability to get people to do things they would otherwise not do, change the course of events, influence behaviours, and overcome resistance (Pfeffer, 1992). In the thesis, the acquisitions of certain products (PPI) are analysed deeply in Chapter 5, and the theoretical background is constructed from the RDT. Objective tensions are partially explained and supported by this theory.	Organisational - Environmental
Institutional Theory (IT) (Meyer and Rowan, 1977)	The institutional pressures that lead to institutional isomorphism are mimetic, normative, and coercive.	NA. This thesis explicitly focuses on the power dynamics between physicians and healthcare organisations rather than the broader institutional pressures that shape these relationships.	Organisational - Environmental
Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975)	Perceptions and beliefs of physicians, like perceived usefulness and the threat of technology, are relevant elements that can shape the behaviour of individuals.	NA. It fails to address the broader systemic issues influencing physician behaviour within the HCSC.	Individual
Agency Theory (Jensen and Meckling, 1976)	It is part of one of the organisational contextual factors of the Stewardship theory and was used in the seminal paper (Nyaga et al., 2015)	They are used to fundament the explanation of the non-hospital-based physicians, where physicians act like	Individual - Organisational

Theory	How is it related to the research?	How is it incorporated?	Level of analysis
		agents and the hospital is the agency (Nyaga et al., 2015), which is explained later in Chapter 4.	
Stewardship Theory (Donaldson and Davis, 1989)	It is part of one of the organisational contextual factors of the Stewardship theory and was used as theoretical background in one of the seminal papers of this thesis (Nyaga, Young and Zepeda, 2015).	They justify hospital-based physicians' specific context where physicians act like hospital stewards (Nyaga, Young and Zepeda, 2015) and developed in Chapter 4.	Individual - Organisational
Structuration Theory (Giddens, 1984)	Structuration theory explains the interplay between individual actors and social structures and how social structures explain individual actions.	NA. Even though it is a relevant theory, this thesis adopts a constructivist research paradigm, and therefore, some of its explanatory power is captured from theories like the RDT.	Individual - Organisational
Actor-Network Theory (Latour, 1999)	It examines the relationship between individuals and technologies	NA. The explanatory power for describing power dynamics is covered by the RDT and Stakeholder theory, which captures the essence of the theory.	Individual
Technology, Organisation and Environment (TOE) (Tornatzky and Fleischer, 1990)	It explains technology adoption from the organisational and environmental levels and the interaction with technology. The framework has been used to complement individual levels of analysis, like the TRA with the TAM model.	NA. The framework's essence is captured by the relationship between the ST, RDT, and IT, creating the bridge between organisational and environmental levels of analysis. Therefore, the nature is captured but not directly used in this thesis.	Organisational-Environmental

Source: The author

Table 2-4 Overview of publications and their relevance included in the SLR

Stakeholder Theory (ST) – 21 articles		Resource Dependency Theory (RDT) – 25 articles		Theory of Reasoned Action (Other theory)– 14 articles		Institutional Theory (Other Theory) – 11 articles		Other Theories – 16 articles		
Article	Relevance	Article	Relevance	Article	Relevance	Article	Relevance	Article	Theory	Relevance
(Alkrajji, Jackson and Murray, 2016)	Medium	(Abernethy and Vagnoni, 2004)	High	(Almarzouqi, Aburayya and Salloum, 2022)	High	(Ahmadi et al., 2017)	Medium / High	(Alzaabi et al., 2023)	Agency Theory	Medium
(Aravazhi et al., 2020)	Medium	(Ahmadi et al., 2018)	Medium / High	(Chau and Jen-Hwa Hu, 2002)	Medium / High	(Beaulieu and Lehoux, 2018)	High	(Aptel and Pourjalali, 2001)	Agency Theory	Medium / High
(Boonstra, van Offenbeek and Vos, 2017)	Medium / High	(Boonstra, Boddy and Bell, 2008)	High	(Hossain, Quaresma and Rahman, 2019)	Medium	(Bialas et al., 2023)	Medium	(Askfors and Fornstedt, 2018)	Social Construction of Technology	Medium / High
(Burns et al., 2007)	Medium	(Chasseigne et al., 2018)	Medium	(Hu et al., 1999)	High	(Budgett, Gopalakrishnan and Schneller, 2017)	Medium / High	(Bhakoo, Singh and Sohal, 2012)	Collaborative inventory management	Medium
(Currie and Brown, 1997)	Medium	(Coombs, Knights and Willmott, 1992)	High	(Huang et al., 2016)	Medium	(Chen and Bennett, 2013)	Medium	Bjørn et al., 2009	Contextual factors	Medium / High
(Currie, Burgess and Hayton, 2015)	Medium / High	(Cox, Chicksand and Ireland, 2005)	High	(Jensen and Aanestad, 2007)	High	(Furukawa et al., 2008)	Medium	(Callen, Braithwaite and Westbrook, 2007)	Stewardship Theory	Medium
(Derecho et al., 2024)	Medium	(D'Aunno et al., 2018)	Medium	(Liu and Cheng, 2016)	Medium	(Gopalakrishna-Remani, Jones and Camp, 2019)	Medium	(Cao, Jones and Sheng, 2014)	TOE	Medium
(Jahangirian et al., 2015)	Medium	(De Vries, 2011)	High / Seminal	(Lu et al., 2020)	High	(Jensen, Kjærgaard and Svejvig, 2009)	High	(Chang et al., 2007)	TOE	Medium
(Langabeer et al., 2009)	Medium	(Doolin, 2004)	High	(Luo et al., 2024)	Medium	(Jones and Wooldridge, 2016)	Medium	(Cucciniello et al., 2015)	Actor-Network Theory (ANT)	Medium / High
(Lawrie et al., 2022)	Medium	(Hellström, Lifvergren and Quist, 2010)	Medium	(Owusu Kwateng, Appiah and Atiemo, 2021)	Medium	(Klecun et al., 2019)	High	(Hussain and Cornelius, 2009)	Structuration Theory	High
(Madhlambudzi and Papanagnou, 2019)	Medium	(Islamoglu and Liebenau, 2007)	Medium / High	(Paré, Sicotte and Jacques, 2006)	Medium / High	(Shahzad et al., 2021)	Medium	(Mamédio and Meyer, 2020)	Project Complexity	Medium / High
(Matopoulos and Michailidou, 2013)	Medium	(Issahaku et al., 2021)	Medium / High	(Sheng et al., 1998)	Medium			(Nyaga, Young and Zepeda, 2015)	Agency Theory / Stewardship Theory	High / Seminal
(Mustafee et al., 2013)	Medium	(Koyle et al., 2018)	Medium	(Tsiknakis and Kouroubali, 2009)	Medium / High			(Papadopoulos and Merali, 2009)	Actor-Network Theory (ANT)	Medium

Stakeholder Theory (ST) – 21 articles		Resource Dependency Theory (RDT) – 25 articles		Theory of Reasoned Action (Other theory)– 14 articles		Institutional Theory (Other Theory) – 11 articles		Other Theories – 16 articles		
Article	Relevance	Article	Relevance	Article	Relevance	Article	Relevance	Article	Theory	Relevance
(Peltokorpi et al., 2008)	Medium / Low	(Kumar et al., 2022)	High	(Walter and Lopez, 2008)	High			(Rappold et al., 2011)	Optimisation quantitative research	Medium
(Pouloudi, 1999)	Medium	(Lingg, Wyss and Durán-Arenas, 2016)	Medium / High					(Schlichter and Rose, 2013)	Structuration Theory	High
(Rosenstein, 2004)	Medium / Low	(Lux and Petit, 2016)	High					(Shaw et al., 2011)	NA. Quality Assurance topics	Medium / Low
(Schlieter et al., 2022)	Medium / Low	(McInnes et al., 2021)	Medium / Low							
(Serrano et al., 2020)	Medium	(Montgomery and Schneller, 2007)	High							
(Stockert and Langerman, 2014)	Medium	(Olson, Obrebskey and Bozic, 2013)	Medium							
(Verleye et al., 2017)	High	(Shrivastava et al., 2024)	Medium							
(Walley, 2013)	High	(Sulz et al., 2022)	High							
(Yang et al., 2015)	Medium	(Sun, 2021)	High							
		(Tong, Tan and Teo, 2017)	Medium / High							
		(Vann Yaroson et al., 2023)	Medium							
		(Zhu et al., 2022)	Medium / Low							

Source: The author

2.5 Physician's Power Dynamics in HCSCM and IS

The influence of physicians in the HCSCM is deeply rooted in power dynamics found in the RDT and ST literature in sections 2.3.1 and 2.3.2. In this section, the author explores literature's state of the art about power and legitimacy and their complex relationship. The chapter development process is described in Table 2-5.

Table 2-5 Physicians' power dynamics in the SCM and IS

Section	Concept	What does this SLR report?
2.5.1	Power	What is Power according to RDT and ST. How do RDT and ST relate according to the literature?
2.5.1	Physicians' power dynamics and its influence in HCSCM	What healthcare SCM / IS practices do the physicians' power dynamics influence? What is a PPI, and why is it important in the Physician's power dynamics?
2.5.2	Legitimacy and Professionalism	Why do physicians have legitimacy in the Healthcare SCM / IS? Who gives them legitimacy? Does legitimacy always lead to power? What are the legitimate interests of physicians? How is legitimacy related to power, and under which circumstances? What is the role of contextual factors in the legitimacy-power relationship?
2.5.3	Physicians' perceptions and beliefs	What is the understanding and meaning of the Healthcare SCM / IS for physicians? What factors influence the adoption, rejection, success, or boycott of Healthcare SCM / IS? How do perceptions, beliefs, and attitudes toward Healthcare SCM / IS practices play an essential role in physicians' power dynamics?
2.5.4	Alternatives or countermeasures employed by hospitals	What alternatives and countermeasures have hospitals used to manage the physicians' power dynamics in Healthcare SCM / IS?

Source: The author

2.5.1 Power and its influence in the Healthcare SCM and IS

Pfeffer (1992) provides a comprehensive definition of power as the potential ability to get people to do things they would otherwise not do, change the course of events, influence behaviours, and overcome resistance (Pfeffer, 1992). Similarly, Doolin (2004), influenced by Foucault's work (1977), characterizes power not as a possession but as a capacity for action that resides within social relationships and is actively exercised (Doolin, 2004; Foucault, 1977). Therefore, RDT power's concept concerns a capacity or ability for action residing in social dynamics.

Moreover, Stakeholder Theory (ST) conceptualizes power as the capability of an individual or a group of stakeholders to exert influence and impact an organisation's decision-making processes, operational procedures, and outcomes. A significant facet within this dynamic is the role of legitimacy, which plays a pivotal role in these power relations and is developed in section 2.5.2. Stakeholders' interests and requirements can substantially influence an organisation's eventual outcomes (Freeman, 1984; Phillips et al., 2003).

In addition to these perspectives, Starr (1982) contends that physicians' authority is not confined solely to social contexts but extends to moral authority (Tasselli, 2015). Starr's (1982) argument asserts that physicians wield authority due to their social standing and because patients place immense trust in them, thereby permeating their power dynamics with a profound moral dimension (Starr, 1982). Patients often rely on physicians as their advocates and physicians' legitimate interests are patients' healthcare (Freidson, 1999; Pouloudi, 1999), adding an essential element to the Healthcare SCM / IS power dynamics.

Furthermore, Mitchell et al. (1997) have introduced an extension of Stakeholder Theory (ST) that goes beyond refining the definition of stakeholders. Their work also clarifies which stakeholders hold relevance within the management domain and why. They offer a comprehensive framework, detailed in Figure 2-4, encompassing three pivotal components: power, legitimacy, and urgency. As discussed in this section, the concept of power constitutes the first critical element

and plays a central role in Chapters 4 and 5. Additionally, aspects of legitimacy will be explored in the following section, 2.5.2.

Furthermore, urgency is defined as the extent to which the needs and demands of a stakeholder necessitate immediate action (Mitchell et al., 1997). Urgency frequently holds prominence in healthcare due to its implications for people's health and well-being. Moreover, it is worth noting that not all legitimate stakeholders possess power. Some physicians, for instance, exemplify this dynamic, highlighting that legitimacy does not necessarily equate to influence or power (Currie et al., 2015; Madhlambudzi and Papanagnou, 2019; Walley, 2013).

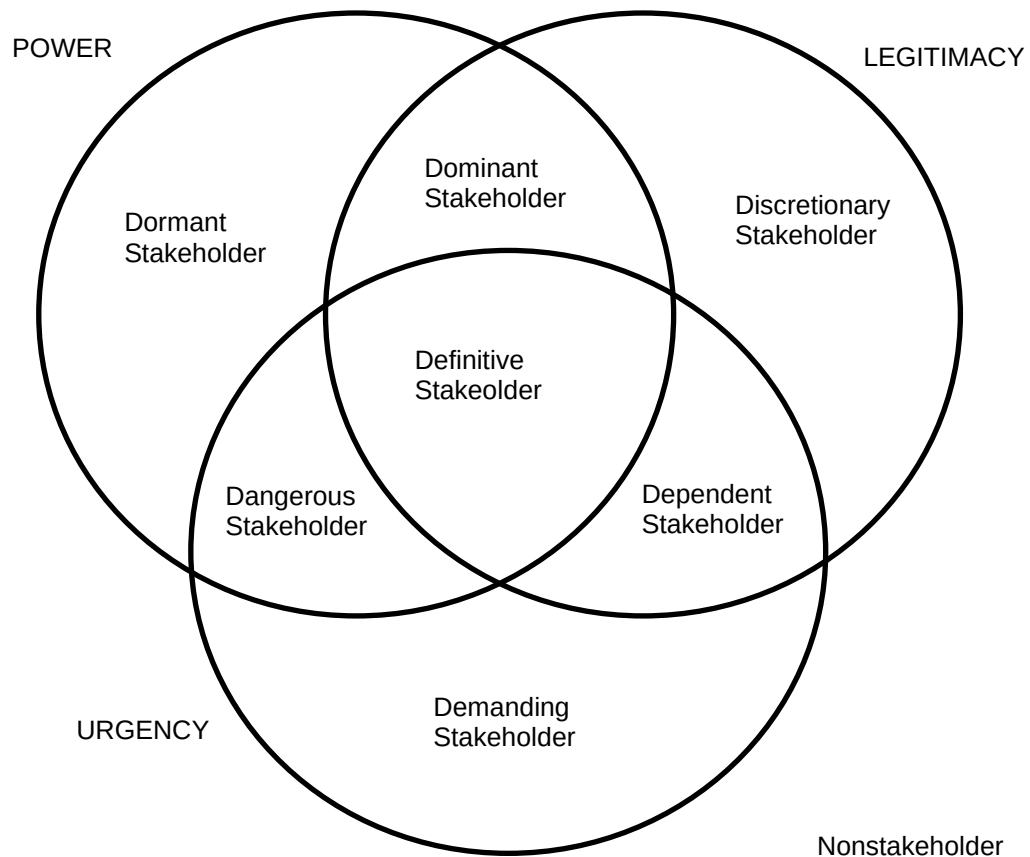


Figure 2-4 Stakeholder Typology

Source: Reproduced from Mitchell et al. (1997)

Moreover, the influence of physicians through power in the healthcare domain is of particular significance, a phenomenon that has gained significant attention in the literature (Doolin, 2004). This influence primarily centres on a category of products known as Physician Preference Items (PPIs) (Askfors and Fornstedt, 2018; Budgett et al., 2017; Montgomery and Schneller, 2007). These items are fundamental in medical and SCM decision-making practices, reflecting the critical interplay between clinical expertise and SCM. PPI encompasses a range of products, including hip and knee implants, cardiac stents, surgical devices, and robotic surgical tools (Cox et al., 2005; Lawrie et al., 2022; McInnes et al., 2021).

The physicians have the final say in determining which product to employ for a specific procedure or patient case and, therefore, the relevance of the PPI in HC SCM (Montgomery and Schneller, 2007). This discretion is grounded in a combination of factors, including their familiarity with certain products, individual treatment approaches, and personal preferences. Some reports suggest that PPIs can account for over 60% of a hospital's product acquisition costs (Beaulieu and Lehoux, 2018). Academic literature indicates that PPI inventory selection strategies could lead to savings of up to 20% of product acquisition costs in healthcare SCM (Cox et al., 2005), along with inventory reductions of up to 70% (Stockert and Langerman, 2014). Therefore, it is evident that physicians play an essential role in the decision-making process, making effective product selection strategies crucial for achieving substantial cost savings (Montgomery and Schneller, 2007; Olson et al., 2013).

However, the management and optimization of PPI strategies are far from straightforward. This complexity arises from the fact that many medical devices produce comparable clinical outcomes, depending mainly on the surgical technique employed by the surgeon, like in fields such as orthopaedics, where a variety of implant options offer similar results. In such cases, the choice between different products often hinges on the physician's preference rather than the patient's specific clinical characteristics (Aravazhi et al., 2020; Koyle et al., 2018).

The selection of these products carries significant implications for SCM practices in HC organisations. The complex nature of these product decisions, where

clinical outcomes can be similar among options, often leads hospitals to explore standardization strategies for reducing costs (Cox et al., 2005). Standardization involves streamlining product choices to achieve greater consistency and efficiency in care delivery (Doolin, 2004). However, the standardization process itself can pose considerable challenges. For instance, defining which items should be standardized requires substantial physician input, given their clinical expertise, legitimacy, and knowledge (Askfors and Fornstedt, 2018; Rosenstein, 2004).

Furthermore, the complexity of PPIs is not confined solely to their selection; it extends to various facets of their management. Materials, design, and technology advancements continue to add layers of complexity to the SCM of these items (Chasseigne et al., 2018). This complexity in product characteristics necessitates close collaboration between healthcare providers and the medical devices industry to ensure that these specialized products are managed effectively (Montgomery and Schneller, 2007).

However, managing PPIs and the influence of physicians poses several challenges to HC organisations. Many hospitals have underdeveloped information systems (Paré et al., 2006), inadequate IM practices (De Vries, 2011), and suboptimal distribution systems (Bhakoo et al., 2012). Unlike industries with standardized supply chains (Jarrett, 1998), hospitals must satisfy many physicians, each with unique preferences and different urgency levels (Mitchell et al., 1997). The influence of physicians on SCM leads to variations in product selection and demand management, even for similar procedures, and sometimes results in non-compliance with medical and clinical guidelines (Aravazhi et al., 2020; Burns et al., 2007; Chasseigne et al., 2018; Koyle et al., 2018; Lawrie et al., 2022). Clinical guidelines are standardized protocols institutions or medical professional groups adopt to improve patient outcomes. The literature highlights cases where physicians' non-compliance with these guidelines affects healthcare SCM and clinical outcomes (Doolin, 2004). Moreover, in the evolving HC landscape, physicians also influence the customization of surgical trays based on

their preferences, sometimes different from clinical guidelines in which PPI is again a central element (Rappold et al., 2011).

The PPI phenomenon is further exacerbated by physicians' brand loyalty and resistance to change (Beaulieu and Lehoux, 2018). This resistance is often grounded in their long-standing relationships with suppliers, brands and past training experiences (Lawrie et al., 2022). Unlike some industries where viable alternatives can be easily found, substituting medical devices can be particularly challenging (Cox et al., 2005). Variations in design, materials, and applications, including regulatory and technical product classification, can create substantial barriers and hurdles, even though the clinical outcome of the product could be similar or equivalent to another product (Beaulieu and Lehoux, 2018; Olson et al., 2013). This situation is also affected by the diverse pace of innovation across different hospital departments (McInnes et al., 2021). Some departments, like internal medicine and psychiatry, progress slower regarding new product innovation, whilst departments like surgery often embrace rapid innovation, introducing new products and clinical processes (Lawrie et al., 2022).

PPIs are also crucial in physicians' power dynamics due to the influence of suppliers on healthcare SCM. For instance, medical device companies, commonly called the HC industry, recognize the significance of physicians' preferences in driving product sales and marketing efforts (Beaulieu and Lehoux, 2018). Physicians' influence over patient decisions makes them a target audience for sales representatives and marketing campaigns (Rosenstein, 2004). Additionally, the impact of the HC industry on physician preferences and prescription patterns can raise concerns about potential conflicts of interest and the objectivity of medical decision-making (Cox et al., 2005).

In the domain of healthcare information systems (IS), physicians wield substantial power and authority. They play a central role in adopting and implementing IS within hospitals (Lu et al., 2020). The success of integrating new technology and electronic health records (EHRs) within healthcare settings hinges significantly on physicians' support and buy-in (Boonstra et al., 2017). Physicians' preferences and requirements influence the customization and design of IS to

align with their workflow and patient care needs (Ahmadi et al., 2018). The influence of physicians on IS adoption and usage extends its impact beyond technology. It significantly affects the efficiency and effectiveness of hospital supply chain processes, including inventory management and resource allocation (Budgett et al., 2017).

In summary, physicians' power in healthcare profoundly impacts SCM and IS practices. Acknowledging and understanding their influence is essential for developing effective strategies that balance patient care objectives, cost-efficiency, and hospital supply chain optimisation (Mustafee et al., 2013). Physicians' influence through power and authority is evident in their substantial impact on healthcare SCM and IS adoption within hospitals. From shaping the selection and standardization of products to influencing the scheduling of clinical practices and using information systems, physicians' decisions are significant in the complexities of Healthcare. Understanding and managing this influence is crucial for optimizing SCM processes and successfully implementing IM practices in Healthcare settings.

2.5.2 Legitimacy and Professionalism

The influence of physicians on decision-making processes in healthcare organisations significantly impacts other stakeholders involved in the healthcare process (Doolin, 2004). Legitimacy, a crucial concept linked to power, is addressed in Stakeholder Theory (ST) as essential to understanding influence dynamics within healthcare (Mitchell et al., 1997). Physicians' legitimacy is grounded in their expertise, social standing, and the trust they inspire among patients, positioning them as central authorities in medical decision-making (Starr, 1982). Freidson (1999) highlights that professionalism grants physicians occupational control, enabling them to shape standards and influence healthcare outcomes.

This section examines the legitimacy of physicians and their relationship with power dynamics, exploring why they hold such influence, the significance of understanding their impact on SCM practices, and the legitimate interests within healthcare.

Physicians are widely recognized as legitimate stakeholders in the healthcare domain (Starr, 1982). Patients, in particular, rely on physicians' judgment and expertise when making medical decisions (Pouloudi, 1999). Due to their medical knowledge and professional standing, physicians are often regarded as trustworthy figures entrusted with significant responsibility for patient well-being and survival (Kumar et al., 2022). This legitimacy is further solidified through formal credentials and affiliations with professional organisations, underscoring the structured knowledge and occupational control that establish their authority (Freidson, 1999).

The physician-patient relationship is built on trust, as patients seek guidance and reassurance from their healthcare providers (Pouloudi, 1999). Physicians' opinions on treatment options, medical procedures, and recovery plans shape patients' choices and emotional well-being, driving adherence to recommended treatments (Verleye et al., 2017). Cognitive competencies also underpin physicians' legitimacy, as their expertise in diagnosis, decision-making, and treatment planning strengthens their authority within healthcare systems (Madhlambudzi and Papanagnou, 2019). Physicians possess specialized skills and knowledge that set them apart from other healthcare professionals (Hu et al., 1999).

Scientific knowledge is integral to physicians' legitimacy, as their authority derives from a deep understanding of evidence-based practices and current medical research (Currie and Brown, 1997). Physicians are expected to stay abreast of advancements in their fields, ensuring optimal patient outcomes. This legitimacy is further supported by the collegial aspect, whereby physicians collaborate with other medical professionals in a mutually respectful environment (Tong et al., 2017). Additionally, physicians engage in inter-professional collaboration, often relying on informal networks to share knowledge and enhance patient care. Tasselli (2015) emphasizes that knowledge transfer between physicians and other healthcare professionals, such as nurses, is essential for fostering innovation and best practices, though professional boundaries sometimes limit seamless knowledge exchange.

The moral dimension of physicians' legitimacy is equally critical, encompassing the ethical principles that guide their medical practice (Starr, 1982). Physicians are expected to prioritize patient well-being, demonstrate empathy, and adhere to ethical standards when interacting with patients and colleagues (Kumar et al., 2022). Their advice and judgments underscore their legitimacy and influence broader healthcare practices (Sun, 2021), including IM (De Vries, 2011) and IS (Boonstra et al., 2008).

Physicians' commitment to patient care and healing strengthens their legitimacy in healthcare (Currie et al., 2015). This legitimacy is further reinforced by their professional competencies, intellectual traits, and associations with respected organisations (Hu et al., 1999). However, the complex relationship between legitimacy and power in healthcare is multifaceted. Although legitimacy is a core power element, it does not equate to dominance (Mitchell et al., 1997).

An illustrative example is found in the varied roles within the medical profession. For instance, general practitioners may be perceived as less powerful than certain specialists (Currie et al., 2015; Verleye et al., 2017; Walley, 2013). This disparity stems partly from healthcare organisations' dependence on scarce resources. Specialists' power is magnified when certain specialities are in short supply, as proposed by RDT (Pfeffer, 1992). In some contexts, patients can be viewed as scarce resources, intensifying power dynamics for specific physician groups, particularly surgeons (Aptel and Pourjalali, 2001; Issahaku et al., 2021).

However, the relationship between legitimacy and power is not uniform, even among specialists with comparable legitimacy. Both cultural and environmental contextual factors shape these dynamics. For example, cultural influences can markedly impact power dynamics in healthcare, as seen in the United States and Taiwan, where centralized or fragmented SCM practices play a role (Chang et al., 2007). Similarly, in healthcare systems like Mexico's National Health System, SCM personnel do not consistently consider physicians' input, limiting their influence (Lingg et al., 2016). These contextual factors—including cultural norms, healthcare system designs, and the influence of medical affiliations—significantly affect power dynamics within healthcare SCM.

A comparative analysis across countries like Costa Rica and Australia further highlights the multifaceted nature of power dynamics (Budgett et al., 2017). Power is shaped by culture and various contextual factors, including healthcare system design and sourcing processes within national healthcare systems (Budgett et al., 2017; Cox et al., 2005; Lingg et al., 2016). Yet, the exact mechanisms by which these contextual elements influence power dynamics remain areas for further investigation that this thesis addresses.

In conclusion, the relationship between legitimacy and power among physicians within the Healthcare SCM / IS is intricate and context-dependent. However, as Tasselli (2015) notes, effective knowledge transfer between physicians and other healthcare professionals is essential for realizing the full potential of these systems, highlighting the role of inter-professional collaboration in achieving healthcare goals. Whilst legitimacy forms the cornerstone of power, it does not guarantee uniform dominance across all medical specialities or geographical contexts (Budgett et al., 2017; Cox et al., 2005; Lingg et al., 2016). Various factors, including resource dependencies, cultural norms, and HC system designs, contribute to the nuanced power dynamics observed within the Healthcare SCM / IS practices. Understanding these dynamics is crucial for effectively navigating the complexities of HC delivery and framing for improving IM practices.

2.5.3 Physicians' perceptions and beliefs about SCM and IS

Physicians, esteemed and influential figures within the HC system, have long enjoyed substantial professional autonomy when making crucial decisions about medical products, procedures, and treatments (Freidson, 1999; Starr, 1982). Their expertise and knowledge have empowered them to choose what they believe to be the most suitable options for their patients. However, the landscape of HC is changing, with a growing emphasis on cost-cutting measures and standardization initiatives (Schneller and Smeltzer, 2006). These changes can sometimes restrict physicians' choices, potentially leading to conflicts between cost-efficiency objectives and physicians' perceptions (Coombs et al., 1992; Doolin, 2004).

This section aims to delve into the outcomes and results highlighted in the literature, considering the ST in section 2.4.2. Whilst much of the literature relies on regression models and does not delve deeply into the 'how' of these changes, it is essential to emphasize that perceived threat and perceived usefulness are central elements in the healthcare domain (Hu et al., 1999; Jensen and Aanestad, 2007; Paré et al., 2006; Tsiknakis and Kouroubali, 2009; Walter and Lopez, 2008).

It is worth mentioning that an inverse correlation exists between perceived threat and perceived usefulness, as empirically tested by scholars (Walter and Lopez, 2008). Factors such as values (Alzaabi et al., 2023; Lu et al., 2020), social influence and subjective norms (Chau and Jen-Hwa Hu, 2002; Hossain et al., 2019), psychological ownership (Paré et al., 2006), self-image (Lu et al., 2020) and trust among stakeholders (Almarzouqi et al., 2022) have all been explored in various studies, demonstrating some correlation with attitudes toward technology adoption. Although research on the specific impact of these factors on HCSCM practices and their reconfiguration is limited, De Vries's work (2011), discussed in section 2.4.3, underscores the significance of attitudes as important concepts.

The role of perceived threat in empirical research is particularly crucial, as it directly influences IS adoption or rejection (Walter and Lopez, 2008) and the understanding of what physicians perceive as a threat. This understanding is closely linked to the earlier discussion on legitimacy, as highlighted in section 2.5.2. Physicians often have a deep-rooted belief in knowing what is best for their patients (Doolin, 2004; Freidson, 1999; Starr, 1982), and any attempt to infringe upon their autonomy may trigger a perceived threat and, consequently, a response (Liu and Cheng, 2016).

This response can manifest in two main ways: personal and normative. On an individual level, physicians might choose not to adopt a specific technology or practice (Sheng et al., 1998). Normatively, a coalition of physicians may collectively alter their behaviour based on shared subjective norms (Jensen and Aanestad, 2007). Notably, compliance with clinical guidelines, as explored in

previous sections 2.5.1 and 2.5.2 of this thesis, can also threaten physician autonomy.

In summary, this section sheds light on the intricate relationship between perceived threats, perceived usefulness and the attitudes and behaviours of physicians, particularly in the context of technology adoption and SCM / IS practices. The significance of physicians' perceptions cannot be understated, as they play a pivotal role in shaping the adoption and framing of technologies and practices within Healthcare. Understanding these dynamics is crucial for this research and the broader HC ecosystem, as it has implications for patient care, cost-efficiency, and the overall effectiveness of HC SCM (Tsiknakis and Kouroubali, 2009).

Moreover, the De Vries (2011) framework has the attitude element embedded in the model; however, it is unclear why physicians perceive the IM system positively or negatively, influencing the system's behaviour. This thesis aims to explore how various contextual factors may shape these perceptions.

2.5.4 Alternatives or countermeasures employed by hospitals

The literature review found that some hospitals have used countermeasures to the power and influence of physicians in SCM / IS practices. It is important to explore the responses from hospitals to the physician's influence in SCM / IS practices because through them, the power mechanisms of physicians can be identified and contextual factors explored, meaning why, in some cases, the measures taken were appropriate. This analysis enriches the understanding of power dynamics through contextual factors in hospitals.

Firstly, hospitals have used lean techniques widely used in IM practices to reduce the number of SKUs by working on standardization in the clinical process (Bjørn et al., 2009; Doolin, 2004). Literature has pledged that standardization should be part of the solution to manage customized surgical trays (Beaulieu and Lehoux, 2018; Bjørn et al., 2009; Issahaku et al., 2021; Nyaga et al., 2015). However, standardization does not emerge naturally but rather from negotiated agreements influenced by internal and external pressures, which could have significant

consequences if not done correctly, such as losing physicians and transferring patients to other hospitals (Nyaga et al., 2015).

However, this shift towards cost or efficiency measures challenges physicians' social and cultural status within the medical community (Cox et al., 2005; Islamoglu and Liebenau, 2007). As leaders and experts in their fields, physicians' authority has been derived from their ability to provide personalized and tailored medical care to their patients (Starr, 1982; Tasselli, 2015). Any constraints on their decision-making autonomy can be perceived as a threat to their social standing and professional identity (Doolin, 2004).

On the other hand, the literature recognizes the cap model to address strategies for standardising and selecting PPIs where physicians are involved and even lead through the implementation of clinical guidelines this process (Montgomery and Schneller, 2007). The cap model shares the cost management responsibility with physicians (Rosenstein, 2004). This model balances physicians' influence in the supply process and healthcare organisations' need for cost management and efficiency. External pressures, including the funding context, may drive strategies that focus on paying for value and performance (Aptel and Pourjalali, 2001; Bjørn et al., 2009; Callen et al., 2007; Hussain and Cornelius, 2009; Issahaku et al., 2021; Jensen et al., 2009). However, the complete understanding of how internal and external pressures and contextual and cultural factors influence the HC SCM remains limited.

As a result of these pressures and challenges, physicians' power to influence HC SCM may be impacted. Their ability to choose PPI may be reduced as hospitals focus on cost-effectiveness and standardization (Aptel and Pourjalali, 2001). This shift in power dynamics depends on contextual factors like organisational (Nyaga et al., 2015) and environmental contexts (Aptel and Pourjalali, 2001; Issahaku et al., 2021) that strengthen or weaken the influence of physicians' power dynamics on the HC SCM as will be discussed in next Section 2.5.

In conclusion, the growing concern over HC costs and SCM efficiency has driven healthcare organisations to implement cost-saving measures and standardization strategies (Cox et al., 2005). Whilst these approaches aim to improve efficiency

and reduce expenses, they can challenge physicians' sovereignty, medical autonomy, and legitimacy (Doolin, 2004; Starr, 1982). As HC systems navigate these complexities, it becomes crucial to balance cost-control efforts, efficiency and preserving physicians' decision-making power and their ability to provide quality patient care through their leadership exercise, recovering trust between the HC SCM / IS and the Clinical domain (Schlichter and Rose, 2013). Standardization efforts should be adequately made; otherwise, physicians' reactions will reduce or block the initiatives. The proposed cap model brings an alternative in which clinical guidelines can also impact the SCM practice whilst improving physician participation through patients' legitimate interests. How the context influences these countermeasures is not presented in the literature, and this gap is covered in the thesis.

2.6 Contextual elements

During the SLR, two key contextual factors that significantly shape the dynamics of HCSCM and information systems are the organisational context, defined by physicians' contract arrangements, and the environmental context, influenced by hospital funding mechanisms. While previous research, such as De Vries's (2011) work, has explored the influence of physicians on inventory systems, this study builds upon that by incorporating these contextual factors. The organisational and environmental contexts enrich the understanding of physician influence and directly shape the research themes by highlighting how these factors sway physicians' power dynamics and decision-making in healthcare institutions (De Vries, 2011; Nyaga et al., 2015). The variation in physicians' contract arrangements (Nyaga et al., 2015) and the contrasting funding mechanisms (Aptel and Pourjalali, 2001) are critical to understanding their impact on healthcare SCM (Montgomery and Schneller, 2007; Issahaku et al., 2021). Moreover, acknowledging these contextual factors is crucial for practitioners, as a "one-size-fits-all" approach to healthcare SCM often fails to address the diverse needs and complexities of different hospital environments. Hospitals tend to resemble one another based on the environment or organisational traits they share (Meyer and Rowan, 1977), and these factors must be considered when

applying SCM practices across diverse settings (Ahmadi et al., 2018; Budgett et al., 2017).

2.6.1 Physicians' contract as organisational context

The organisational contextual element of physician labour arrangements holds significant importance in HC systems (Nyaga et al., 2015). Academics have highlighted these distinctions, emphasizing the role of culture in shaping Healthcare SCM / IS (Ahmadi et al., 2018; Budgett et al., 2017). This variation in physician employment relationships, ranging from exclusive dedication to multiple institutional affiliations, can significantly impact healthcare IM practices. In this context, Nyaga et al.'s (2015) findings explore how these intra-organisational physician arrangements affect HC SCM. Their research provides valuable insights into the relationship between physician employment and contract management and its impact on HCSCM efficiency (Nyaga et al., 2015). Their study suggests that aligning logistics objectives with physician employment arrangements can foster a sense of responsibility and ownership among clinical staff. This alignment potentially leads to enhanced cooperation and collaboration in logistics decisions, particularly within the embedded inventory system.

One notable finding from the study is the positive correlation between the proportion of hospital-based physicians and SCM efficiency. Their analysis suggests that a higher ratio of hospital-based physicians contributes to the improved efficiency of the supply chain (Nyaga et al., 2015). This relationship indicates that a more significant presence of hospital-based physicians within the hospital's organisational framework can facilitate the alignment of physician behaviour with SCM objectives, thus strengthening the decision-making processes related to SCM performance.

The study's implications extend to SCM performance, particularly in purchasing decisions and SKU standardisation of PPI. A higher number of hospital-based physicians within an institution fosters stewardship over resources and a more profound sense of organisational commitment. This commitment extends beyond financial aspects, encompassing emotional ties to the institution. These findings are significant, as they shed light on how physician labour arrangements may

positively influence IM performance, particularly concerning the standardization of items within IM and its subsequent effects on planning, control, and physical systems (Montgomery and Schneller, 2007).

The thesis incorporates the organisational contextual element of physician labour arrangements into the De Vries (2011) framework explored in section 2.4.3, providing a more comprehensive understanding of the influence of physicians on the SCM system within hospitals. This contextual factor underscores the dynamic between physicians' contract relationships and their impact on the IM system. By examining the stewardship, commitment, and alignment of physician behaviour, this thesis understands how these elements enrich the knowledge of HC SCM/IS power dynamics. Consequently, further exploring this contextual factor promises to advance healthcare systems' comprehension and optimization. Incorporating contract arrangement as a contextual element is a novel theoretical contribution extending the understanding of stakeholders' power dynamics in IM practices.

2.6.2 Hospital's funding as environmental context

Contextual factors, such as the funding mechanism of a hospital, play a crucial role in shaping the dynamics of HC systems (Aptel and Pourjalali, 2001). Effective payment mechanisms are essential for ensuring the quality, efficiency, and responsiveness of HC services to meet the diverse needs of populations (Issahaku et al., 2021). This SLR includes the impact of funding mechanisms on healthcare systems, drawing insights from Ghana's public healthcare system (Issahaku et al., 2021) and a cross-national comparison of French and American hospital systems (Aptel and Pourjalali, 2001). This section aims to take elements from the literature review to extend and enrich the understanding of power dynamics in Healthcare SCM.

Adopting value-based payment mechanisms in the HC system has been a subject of interest (Issahaku et al., 2021). It represents a shift from traditional volume-based payment models to compensating healthcare providers based on the value of patient services. Stakeholders in Ghana, including policy-makers, implementers, insurers, and healthcare providers, expressed varying perceptions

regarding the feasibility of value-based payment (Issahaku et al., 2021). Whilst it gained acceptance, participants emphasised the necessity of supportive systems and the resolution of potential implementation challenges. These challenges, including physicians in the SCM process for orchestrating the PPI management (Montgomery and Schneller, 2007), are part of what this thesis aims to unravel.

Moreover, comparative studies have shed light on the influence of contextual factors, particularly funding orientation, on HC system performance (Aptel and Pourjalali, 2001; Budgett et al., 2017; Shrivastava et al., 2023). One such study contrasts the logistics processes in American and French hospital systems, revealing that the American system outperforms SCM metrics (Aptel and Pourjalali, 2001). The critical differentiator is the funding orientation. Fueled by private sector funding, American hospitals operate in competitive environments that reward efficiency. This pressure drives logistics departments to adopt SCM practices like Just-in-Time, direct shipments, VMI, and collaborations with medical departments, reducing inventory carrying costs (Aptel and Pourjalali, 2001; Budgett et al., 2017; Vann Yaroson et al., 2023).

Private funding sources create market pressures that motivate hospitals to optimize their logistics processes (Aptel and Pourjalali, 2001). In the American context, the emphasis on cost reduction drives logisticians to seek innovative solutions, ultimately outperforming their public funding source counterparts. The impact of funding orientation extends beyond logistics, affecting various aspects of hospital functioning, including the influence of physicians (Lingg et al., 2016). Physicians in private-funded hospitals often face market-driven incentives, leading to different behaviours and fostering teamwork, clinical standardization, and the adoption of IS projects (Aptel and Pourjalali, 2001).

Considering De Vries's (2011) work, which focuses on stakeholder dynamics and reshaping its Inventory system (De Vries, 2011), it becomes evident that funding orientation is a substantial contextual factor. The funding mechanism influences a hospital's operational efficiency and IM performance, whether public or private. Analysing contextual factors and the broader healthcare environment should

enrich the understanding of how power dynamics are affected by environmental factors. However, it becomes evident that the literature reviewed does not explore how this phenomenon occurs. This thesis's contribution is that hospital funding orientation is an environmental contextual element influencing surgeons' power in SCM practises, expanding the understanding of De Vries's (2011) framework.

2.7 Conclusion

This SLR culminates in a comprehensive synthesis of 88 articles and their theoretical frameworks within Healthcare IM, SCM and IS. The review also critically examines De Vries's (2011) framework, which serves as the theoretical backbone of this thesis, with a particular focus on stakeholders' attitudes, power, and interests and their impact on shaping inventory systems. De Vries's (2011) model highlights physicians' significant, albeit indirect, role in the inventory process and their influential position within inventory systems; it overlooks the broader environmental and organisational contexts that shape these power dynamics. This gap in the literature is addressed by incorporating RDT (Pfeffer and Salancik, 1978) and ST (Freeman, 1984) as the theoretical foundations, providing a more comprehensive understanding of how these contexts influence and (re)shape the IM system.

Additionally, the review reveals that contextual elements like funding mechanisms and physician's contract types have demonstrable implications on SCM/IS. These insights are supported by research from Aptel and Pourjalali (2001), Budgett et al. (2017), Issahaku et al. (2021), Lingg et al. (2016) and Nyaga et al. (2015). Consequently, this thesis explores how these contextual factors are linked to physicians' power dynamics and interests in the healthcare IM system.

Moreover, the SLR highlights the crucial role of user perceptions, as highlighted in section 2.5.4. Physicians who perceive a system as valuable are likely to adopt, implement, or embrace it (Hu et al., 1999; Jensen and Aanestad, 2007; Paré et al., 2006; Tsiknakis and Kouroubali, 2009; Walter and Lopez, 2008). Conversely, they may resist, block, or sabotage it if they see it as useless or

threatening. Nevertheless, the literature fails to explain how organisational and environmental contextual factors influence these attitudes. The study of attitudes has been predominantly from an individual level, with limited exploration of how other levels sway these attitudes.

As far as the author knows, the literature has not explained how contextual factors at the environmental and organisational levels influence physicians' power and, consequently, reshape the Inventory system—a significant gap in current research. This thesis addresses this gap by inquiring into the following research questions (RQ):

RQ1: *How does the funding orientation of a hospital (private or public) sway the surgeon's influence in the Inventory System at the OT?*

RQ2: *How does the hospital's contract arrangement (hospital-based or non-hospital-based) sway the surgeon's influence in the Inventory System at the OT?*

As a result, this thesis proposes an extension of De Vries's (2011) model to increase the understanding of how contextual factors sway stakeholder power in Inventory systems.

3 METHODOLOGY

3.1 Research Methodology

3.1.1 Deductive Reasoning

This thesis adopts a deductive reasoning approach, with De Vries's (2011) framework as the starting point for developing the revised framework model (Chapter 6). The model is examined through two theoretical lenses: Resource Dependency Theory (RDT) (Section 2.4.1) and Stakeholder Theory (ST) (Section 2.4.2). These lenses enrich this exploratory research, as discussed in the conclusions of the systematic literature review (SLR) in Chapter 2. Drawing on Popper's (1959) advocacy for deductive reasoning in social sciences, this conceptual synthesis with the theoretical model marks the first step in a deductive research approach.

The categories (second-cycle codes) and themes (aggregated dimensions) used to analyze the qualitative data were defined based on insights from the SLR. As Saldaña (2016) outlined, these themes and categories emerged during the SLR process, forming the basis for data analysis. The coding process itself will be further explained in Chapter 4. The research focuses on two primary themes (aggregated dimensions) to explore the phenomenon: Power and Physicians' Interests. These themes were shaped by the definitions and descriptions provided in Chapter 2.

The Power theme, as defined in Section 2.5.1, is understood as the potential to get people to do things otherwise they will not do it, influence behaviours, change the course of events, and overcome resistance (Pfeffer, 1992). The theme of Power was further categorized based on how power dynamics were observed in the data. The process of grouping first-cycle codes into these categories will be detailed in Chapter 4.

The Physicians' Interests theme was derived from second-cycle codes, informed by concepts from the SLR (Section 2.5.2), and developed from first-cycle codes

and data. Physicians' interests in Inventory Systems are shaped by multiple factors, such as advocating for patients' needs (Currie and Brown, 1997; Doolin, 2004), personal product experience (Aravazhi et al., 2020; Cox et al., 2005; Koyle et al., 2018), relationships with the medical devices industry (Beaulieu and Lehoux, 2018), and cost considerations (Burns et al., 2007; Olson et al., 2013).

The categories used to describe the Power and Physicians' Interests themes, derived from the SLR, served as the foundation for the deductive approach in this research (Popper, 1959). This deductive reasoning framework allowed for the testing and refinement of theories, drawing on the concepts defined in the SLR to inform the development of the categories and themes.

The revised framework in the concluding chapter builds on De Vries's (2011) model, integrating new elements identified through qualitative research and case study methods. In this process, the coding approach significantly shaped the analysis, as detailed in Chapter 4. Table 3-1 presents the categories and themes used in this research, derived from the SLR conducted in Chapter 2. Figure 3-1 illustrates this thesis's research methodology and process.

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Table 3-1 Categories and Codes Prior to the data collection

ID	Code	Type of Code	Source	Reference in Chapter
A	Getting people to do things otherwise will not do it	Category (Second-cycle code)	Chapter 2 - SLR	2.5.1
B	Changing the course of events	Category (Second-cycle code)	Chapter 2 - SLR	2.5.1
C	Influencing behaviour	Category (Second-cycle code)	Chapter 2 - SLR	2.5.1
D	Overcoming resistance	Category (Second-cycle code)	Chapter 2 - SLR	2.5.1
E	Power of Surgeons	Theme (Aggregated dimension)	This category is built from codes A to D	2.5.1
F	Representing patient's interest	Category (Second-cycle code)	Chapter 2 - SLR	2.5.2
G	Experience with a particular product	Category (Second-cycle code)	Chapter 2 - SLR	2.5.2
H	Relationship with manufacturing representatives	Category (Second-cycle code)	Chapter 2 - SLR	2.5.2
I	Representing costs interest	Category (Second-cycle code)	Chapter 2 - SLR	2.5.2
J	Interest of Surgeons	Theme (Aggregated dimension)	This category is built from codes F to I	2.5.2
K	Surgeon's perceptions of the IM practices	Category (Second-cycle code)	Chapter 2 - SLR	2.5.3
L	Surgeon's contract context influences the IM practices	Category (Second-cycle code)	Chapter 2 - SLR	2.6.1
M	Hospital's funding orientation influences the IM practices	Category (Second-cycle code)	Chapter 2 - SLR	2.6.2

Source: The author

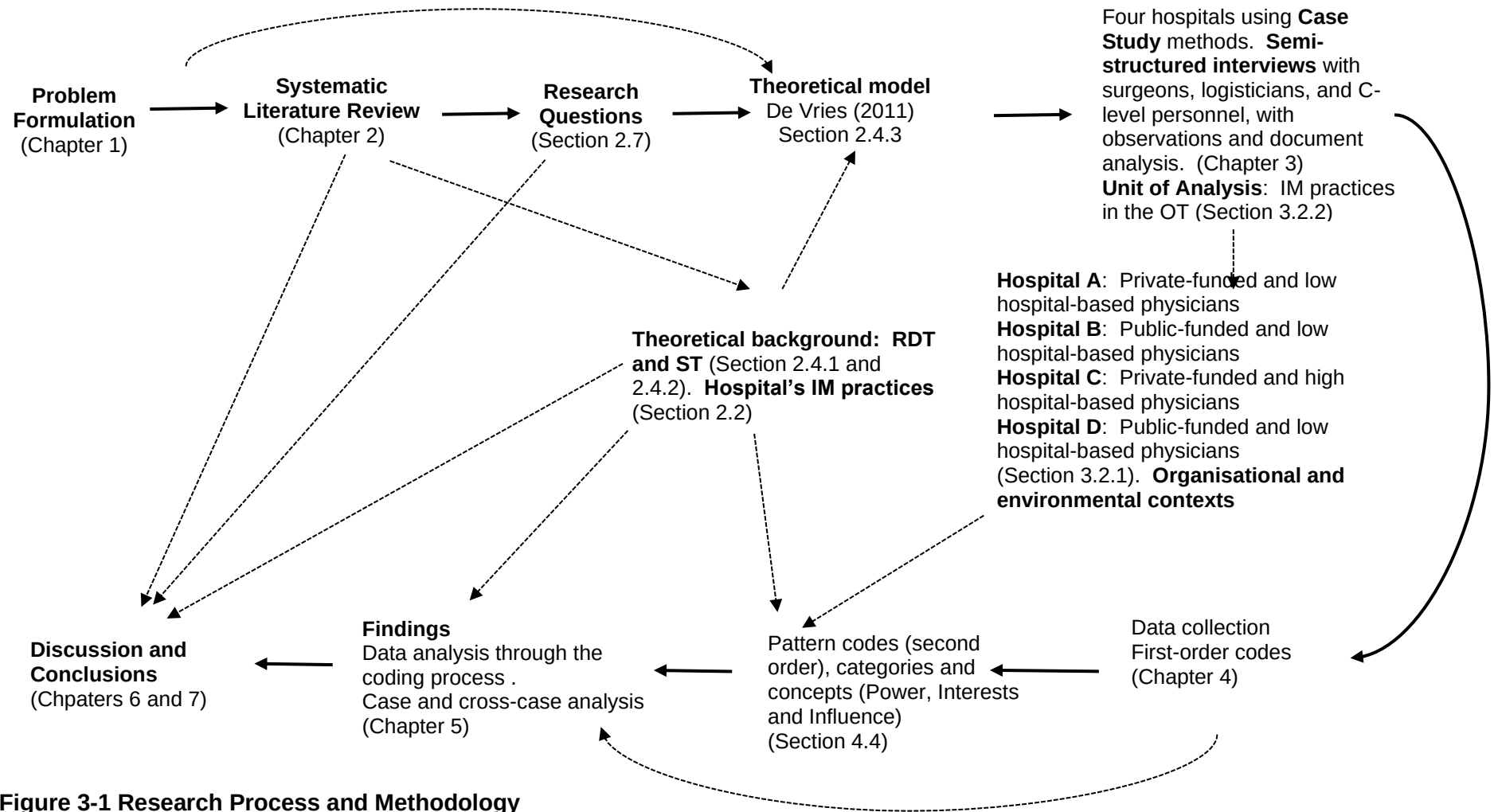


Figure 3-1 Research Process and Methodology

Source: The author

3.1.2 Research Philosophy

The choice of the interpretivism paradigm, also known as the “constructivism” research paradigm, is rooted in a constructionism epistemology (Blaikie, 2007). This approach is based on the understanding that contextual factors significantly influence individuals' perceptions, behaviours, and interactions within an organisational setting (Blaikie, 2007; Weber, 1964). Just as Max Weber's (1958) seminal work highlighted how religious beliefs, particularly Protestantism and Catholicism, influenced the accumulation of wealth, this research explores how varying contextual factors—specifically organisational and environmental contexts—shape the power dynamics in SCM practices within healthcare institutions, as discussed in Section 2.6 of the literature review.

Exploring the socially constructed power dynamics, perceptions, beliefs, and attitudes of surgeons that influence IM practices in different contexts, this study examines how factors such as physicians' contract arrangements (organisational context) and funding mechanisms (environmental context) shape these dynamics across four case studies. The research adopts the epistemology of constructionism (Blaikie, 2007) to understand these contextual factors and influences. Furthermore, this exploratory study aims to understand how social actors, such as surgeons, modify and shape daily practices—specifically, inventory management (IM) in this thesis—along with their motives and interests (Schutz, 1972).

The theoretical model used in this research posits that IM practices are (re)framed differently depending on social contexts, such as funding orientation and physician contract type. Consequently, this thesis adopts an ontology of 'idealism,' recognizing that multiple realities exist across the various social contexts examined. Furthermore, the study embraces an interpretivism paradigm (Blaikie, 2007), which asserts that understanding social phenomena necessitates comprehending the social world constructed and reproduced by individuals in their daily activities (Weber, 1964)—specifically, the IM practices. In this framework, a 'constructionism' epistemology facilitates the exploration of different contexts through case study methods (Blaikie, 2007)

3.2 Case Study

The selection of a case study as the research method for this deductive study was deliberate and well-founded, owing to its established relevance and suitability in the field of organisational sciences. Eisenhardt's seminal work in 1989 highlighted the effectiveness of case studies as a research approach (Eisenhardt, 1989). More recently, scholars in the operation management and SCM domains, such as Ketokivi and Choi (2014), have advocated the importance of case study methods, particularly in research involving mixed methods and qualitative inquiries (Ketokivi and Choi, 2014).

Following Yin's approach (2018), the research seeks to deepen the understanding of the research questions by examining differences and commonalities across the cases, thereby filling the gap in the existing literature. The impact of contextual elements in the De Vries (2011) model on IM systems is explored through semi-structured interviews and observations of contemporary events within the case study settings.

3.2.1 The four cases selection

One key advantage of employing a multiple case study design is the incorporation of replication, which enhances the rigour of the research (Eisenhardt, 1989). In this thesis, using four distinct cases allows for exploring their similarities and differences regarding the context sway in the power dynamics of hospital's IM practices. The criteria used for selecting the cases are described in

Table 3-2 regarding the hospital characteristics, location, and the inclusion of the organisational and environmental contexts defined for the research.

Table 3-2 Selection criteria of the cases

Criteria	Aim
Hospital characteristics	General hospitals with high surgical volume: The study aims to explore the phenomenon in large hospitals (more than 200 hospital beds) with high complexity and a broad range of surgical procedures.
Location	The hospitals were selected near the author's home city of Bogotá, Colombia's capital, allowing follow-up visits to gather additional observations and documents after the interviews. Access to information was facilitated by the author's

	professional network in the healthcare sector as an executive practitioner. A detailed description of Colombia and its healthcare sector can be found in Appendix N.
Organisational context (Physician's contract type – High and low hospital-based physicians)	The study includes hospitals representing the two contrasting points of organisational context: hospitals with hospital-based physicians and those with non-hospital-based physicians.
Environmental context (Privat-funded and Public-funded hospitals)	The study includes hospitals representing the two contrasting points of the environmental context: private and public funding.

Source: The author

This study adopted a four-hospital case study design (see Table 3-3), and this approach allows for a comparative analysis of different contexts and their impact on surgeons' power dynamics in IM. It is important to acknowledge that case study research does not primarily aim for generalization like large-scale quantitative research (Lincoln and Guba, 1985). Instead, it seeks depth and detailed insight into the dynamics of a particular phenomenon (Yin, 2018), which is particularly suitable when studying complex systems like hospital SCM (Kim and Kwon, 2015; Towill and Christopher, 2005; Volland et al., 2017).

The selection of the four case studies was guided by the two key contextual factors that emerged during the SLR, as detailed in Section 2.6: physicians' contract arrangements (organisational context) and hospital funding mechanisms (environmental context). These factors were critical in shaping power dynamics and decision-making in HCSCM and IS, making them central to the research. Physicians' contract arrangements, from hospital-based to non-hospital-based affiliations, significantly influence their involvement in SCM practices and decision-making authority. This organisational context is important because it directly impacts how physicians engage with hospital systems, including the Inventory system (Nyaga et al., 2015). Similarly, the funding mechanisms—whether public or private—affect the operational priorities of healthcare institutions and create distinct pressures that influence SCM strategies (Aptel and Pourjalali, 2001; Issahaku et al., 2021).

Moreover, the study adopted Eisenhardt's (1989) approach to case study selection, which suggests using contrasting cases to increase the depth and robustness of the analysis. By selecting hospitals that represent the contrasting

points along the two dimensions of organisational and environmental contexts, the study aims to explore how these contextual factors interact and influence IM. Eisenhardt (1989) advocates that selecting cases that differ on key dimensions allows for richer insights into the phenomenon being studied. In this case, hospitals with differing contract arrangements and funding mechanisms provide a clear framework for comparing the influence of these factors on SCM dynamics.

The hospitals selected for this study represent a 2x2 matrix, as seen in Table 3-3: the vertical axis represents physicians' contract arrangements (from low hospital-based to high hospital-based), and the horizontal axis represents funding mechanisms (from private to public). This matrix allows for exploring how these contextual factors interact to shape IM practices across the four selected case studies. Following Eisenhardt's (1989) logic, contrasting cases were chosen to highlight the differences in how contextual factors influence power dynamics and decision-making, ultimately enriching the theoretical development of the study.

Table 3-3 The four case studies

Organisational context	<i>High hospital-based physician ratio</i>	Hospital C	Hospital D
	<i>Low hospital-based physician ratio</i>	Hospital A	Hospital B
		<i>Private-funded</i>	<i>Public-funded</i>

Environmental context

Source: The author

By selecting hospitals that embody these contrasting points along the organisational and environmental dimensions, the study ensures a comprehensive exploration of how contextual factors influence IM practices, providing insights grounded in the specific conditions present in each healthcare institution. This selection strategy, as guided by Eisenhardt (1989), allows for a rich and in-depth investigation (Yin, 2018) into the role of context in shaping healthcare inventory systems.

Furthermore, the decision to include four hospitals aligns with the theoretical saturation principle, as Yin (2018) described. Saturation is reached when additional cases no longer yield new significant insights, indicating that the selected cases can fully explore the research questions. The four hospitals in this study represent distinct points of contrasting hospital contexts (Eisenhardt, 1989). This balance allows for a comprehensive exploration of how funding mechanisms and organisational structures influence IM practices, ensuring diversity whilst maintaining analytical depth. Adding more cases would not necessarily enhance the theoretical contribution; instead, it could dilute the focus and precision of the analysis (Eisenhardt, 1989).

Eisenhardt (1989) also highlights that the number of cases should be chosen based on theoretical rather than statistical logic. In this context, four cases provide a robust foundation for generating theoretical insights whilst allowing for cross-case comparison. Including private and public institutions adds a layer of complexity that enriches the analysis without compromising the depth of understanding that can be achieved through detailed observations, semi-structured interviews and document analysis. The goal is to theorise in the data collected from these diverse yet representative settings.

Finally, it is important to emphasize that in case study research, the number of cases is less significant than the quality of the data collected (Eisenhardt, 1989; Yin, 2018). Using semi-structured interviews, observations, and document analysis allows for collecting rich, nuanced data to provide deep insights into inventory systems across different hospital settings. This approach aligns with the argument put forth by Eisenhardt (1989), who contends that combining multiple data sources enhances the rigour and credibility of the findings.

3.2.2 The Unit of Analysis – IM practices in the OT

The research unit of analysis is the IM practices within hospital Operating Theatres (OTs). The focus on OTs arises from the recognition of the unique challenges and opportunities inherent in this critical healthcare setting (Burns et al., 2007; Lawrie et al., 2022; Montgomery and Schneller, 2007; Olson et al.,

2013; Peltokorpi et al., 2008; Rappold et al., 2011). Surgeons emerge as crucial stakeholders, significantly influencing hospital IM (Rosenstein, 2004; Stockert and Langerman, 2014), making the OT environment particularly suited for an in-depth study of IM practices.

The decision to focus on IM within the high-pressure environment of hospital OTs is motivated by several methodological considerations. OTs are often viewed as a hospital's clinical and financial heart, accounting for over 60% of hospital revenues and costs (Montgomery and Schneller, 2007). This significant financial implication underscores the necessity of effective IM practices to optimise resources, reduce waste, and enhance patient care outcomes. Moreover, the operational dynamics within OTs involve high variability due to clinical diversity, unpredictable patient inflows, the technical nuances of different surgical approaches, and varying levels of surgeons' expertise (Lega et al., 2012). This complexity provides a rich context for exploring how IM practices can be adapted and improved to meet the demands of this environment.

From a methodological standpoint, focusing on OTs allows a more detailed examination of the unique challenges faced in this setting, distinguishing it from other healthcare services such as central pharmacy operations. Recent research has shown substantial potential for cost reduction through implementing effective IM practices in OTs (Chasseigne et al., 2018; Cox et al., 2005; Koyle et al., 2018). Additionally, the objective of IM in OTs is to achieve a delicate balance between ordering costs—which include administrative staff time—and carrying costs associated with inventory levels, all whilst improving service levels and ensuring patient safety (Verleye et al., 2017).

The complexity of IM in OTs is underscored by the FDA's (Federal Agency of the United States Department of Health and Human Services) perspective, which highlights IM's specialised nature compared to other healthcare services (FDA, 2018), as described in Table 3-4. The unique demands and pressures associated with surgical procedures require tailored IM strategies that address the immediate needs of surgical teams and the broader goals of hospital efficiency and patient safety (Machline, 2008; Melson and Schultz, 1989).

Table 3-4 Complexity of IM in the OTs

	Operating Theatre (OT)	Central Supply Pharmacy
Where is the storage of the inventory?	Special carts, ORs and OR storage area, Main central storage area	Main Central Storage area, Pharmacy storage area
Automation	Non or Little automation	More than 60%
Turns of Inventory per year	0,9 to 2,5	9,0 to 12,0
Inventory value	Three times the central supply inventory	
Number of SKUs (Average)	2.000 to 4.000	1.000 to 1.700
Type of Inventory	Single-use vs Reusable items, Pre-assembled sterile kits and anaesthesia pharmaceuticals	Pharmaceuticals, disposables
Demand management	Urgency, Elective (frequent cases) and Elective (non-frequent cases)	Urgency and Regular demand
Consolidation or equivalence of inventory	Consolidation is complex, e.g. 450 different SKUs for surgical sutures. Consumables and Special Items – PPI	Consolidating pharmaceutical products is more manageable, and the molecules are equivalents of the same active principle.
Physical system's location	1 to 20	1 to 2

Source: (FDA, 2018; Machline, 2008; Melson and Schultz, 1989).

The heightened focus on IM within OTs as the unit of analysis for this research is justified not only by the financial significance and complexity of the environment but also by the methodological sound. It offers an opportunity to uncover insights that can enhance IM practices in one of the most critical areas of healthcare delivery. Focusing on OTs enables the study to explore the interplay between organisational and environmental contextual factors, such as physicians' contract arrangements and hospital funding mechanisms, both emerged from the SLR as central to understanding the dynamics within healthcare supply chains. These contextual factors influence IM practices uniquely, providing valuable contributions to the existing literature on healthcare SCM.

Moreover, the study is methodologically robust due to the diverse and dynamic nature of the OT environment. The variation in surgeons' preferences, clinical diversity, and patient influx offers a rich dataset that can reveal the complexities

of IM practices within high-pressure hospital environments. This methodological approach explores how tailored IM strategies can improve efficiency and reduce costs whilst ensuring patient safety according to contextual factors.

3.2.3 Participants interviewed

In this regard, the study included three distinct participant groups: Surgeons, C-level executives, and Logisticians, ensuring a range of perspectives and validating the participants' claims (Eisenhardt, 1989). Semi-structured interviews explored power dynamics, interests, perceptions, attitudes, and performance across different contexts. Using three distinct questionnaires ensured consistency in data collection whilst allowing for the capture of important elements and openness to additional insights. The questionnaires are provided in Appendices K, L, and M, and a detailed explanation of the data collection process in Chapter 4.

Different questionnaires were used to validate the responses obtained from the three participant groups. A pilot test was conducted with three interviewees to ensure that the three proposed groups in the hospital were appropriately represented in the study. As a result, the author revised some questions and added others (the changes, highlighted in bold, are shown in Appendices K, L, and M). Additionally, transparency was ensured by recording and transcribing all interviews, preserving the integrity of the data and facilitating future verification and analysis.

To justify the profile of the interviewees selected for this study, the combination of roles—two logisticians, two C-level executives (including the Chief Medical Officer), and one surgeon (the head of the general surgery service)—ensures a comprehensive view of the IM practices within each hospital, which is essential for triangulation in qualitative research. The selection of these individuals was strategic, based on their varying levels of involvement in supply chain decisions, their influence on IM practices, and their unique perspectives on healthcare delivery.

Furthermore, as mentioned in the literature by Lincoln and Guba (1985), trustworthiness in qualitative research is built on credibility, and triangulation is one way to enhance credibility. By interviewing stakeholders from different levels within the hospital—logisticians responsible for the day-to-day management of supplies, C-level executives who shape overall organisational policies, and surgeons who are the primary users of surgical inventory—the study achieves a balanced, triangulated perspective. Each role provides unique insights into managing, using, and optimising inventory, contributing to a richer, more robust analysis.

3.2.3.1 Role of Logisticians

Including two logisticians per hospital ensures that the operational side of inventory management is well-represented. Logisticians are involved in planning, procuring, storing, and distributing inventory items, including critical and high-value surgical items (PPIs). Their insight helps to understand the practical challenges of managing inventory in dynamic environments, such as operating theatres, and the systemic issues related to supply chain efficiency and availability. Including logisticians in the interview pool offers firsthand information on practices and technological systems.

3.2.3.2 Role of C-Level Executives

Two C-level executives, including the Chief Medical Officer, were chosen per hospital to understand how high-level decisions and policies affect inventory management. The C-suite typically has a macro view of hospital operations, including budget allocations for medical supplies and investments in technology to improve supply chain efficiency. Their perspectives are critical in understanding the strategic decisions that influence how resources are allocated, how inventory policies are formulated, and how operational goals are set. They provide insight into the institutional priorities that shape inventory practices and the broader organisational context that logisticians work within.

3.2.3.3 Role of Surgeons

The head of general surgery was included as a key informant because surgeons are the primary users of surgical inventory items, particularly PPI and critical medical devices. Their feedback is invaluable in understanding the specific needs within the OT, their preferences for particular items (PPIs), and how they influence inventory decisions. Surgeons also provide insight into the consequences of inventory shortages or inefficiencies during surgeries, directly affecting patient safety and operational efficiency. Their input is vital for understanding how the supply chain aligns with or diverges from the clinical needs of healthcare providers.

3.2.3.4 Conclusions about the participant's choice

The selection of these roles aligns with theoretical frameworks for case study research. As Eisenhardt (1989) emphasizes, the key to building strong theory from case studies is ensuring that data is drawn from multiple, relevant perspectives within the organisation. The interviewees in this study were chosen to represent different hierarchical levels and functional areas within the hospital, which provides a more complete picture of the complex interplay between IM practices and healthcare delivery.

Moreover, by including both logistical and clinical perspectives, the study is better positioned to address the research questions related to the efficiency of inventory management systems, the influence of surgeon preferences on supply chain decisions, and the overall impact on hospital performance. As supported by Lincoln and Guba's (1985) framework of credibility and triangulation, involving diverse informants ensures that the findings are comprehensive and reflective of the real-world complexities observed in healthcare settings.

The selection of interviewees—logisticians, C-level executives, and surgeons—was guided by the need to triangulate data and build a credible, trustworthy narrative. Each group provides a unique and essential perspective on IM practices, contributing to a holistic understanding of how these practices affect hospital IM practices. Combining these perspectives ensures that the study

captures both operational and strategic dimensions of IM, offering more profound insights into the interactions between clinical needs and logistical constraints.

3.2.4 Observations and Document Analysis

Observations were conducted to complement the case study, providing real-time insights into hospital practices and aiding in the triangulation of interview data, aligning with case study methodologies outlined by Yin (2009) and Eisenhardt (1989). The author's observations, carried out between 2019 and 2021 in the operating theatres of four hospitals—Hospital A, Hospital B, Hospital C, and Hospital D—were delayed due to COVID-19 disruptions. These observations focused on each hospital's management of PPIs and critical items within surgical departments, revealing distinct approaches influenced by operational structure, surgeon preferences, and technological capabilities, are presented in Chapter 4.

Document analysis further strengthened the study's credibility and confirmability, which Lincoln and Guba (1985) identified as a means of establishing trustworthiness in qualitative research. This analysis provided a structured basis for triangulating data from interviews and observations, enhancing the research's validity (Eisenhardt, 1989) by grounding participant-driven data in formal evidence. Following Yin's (2018) emphasis on multiple data sources, this integration contributed to the study's trustworthiness by allowing for corroboration or contrast between data sources.

3.2.5 Other considerations

The author assumed the role of an *outsider* and not an insider. An outsider's role is important in this research because there is no influence on the research, and the exploration of meanings and interpretations is captured (Blaikie, 2007). The study relies on observations and interviews and stands back from the phenomenon. On the other hand, he adopted a *learner role* (Blaikie, 2007). The explanations for the RQs emerge from the Theoretical Model's different lenses; however, the findings and discussions arose from observations and analyses of the case studies. Finally, this research is *on* people, and through the interaction

with the case study, the study explains the social reality of power dynamics in the IM practices in the OT and the sway of contextual factors.

Furthermore, this research adopts an exploratory approach, aiming to uncover the motivations and meanings of individuals involved in hospital inventory systems without imposing external control. This approach aligns with the "how" form of the research questions, focusing on non-control over behavioural events and the study of contemporary events (Yin, 2018), as outlined in Table 3-5.

Table 3-5 Type of Research Methods in Qualitative Research

Method	Form of Research Question	Requires control over behavioural events	Focuses on contemporary events
Experiment	How, why?	yes	yes
Survey	Who, what, where, how many, how much?	no	yes
Archival analysis	Who, what, where, how many, how much?	no	Yes/no
History	How, why?	No	no
Case Study	How, why?	No	yes

Source: Reproduced from Yin (2018, p.8)

3.3 Trustworthiness of the Research

In qualitative research, trustworthiness is crucial to ensure that the findings and conclusions are reliable and credible. Lincoln and Guba (1985) propose four key criteria to establish trustworthiness: credibility, transferability, dependability, and confirmability. In this thesis, various methods, including interviews, observations in the OT and document analysis, have been employed to explore IM practices in hospitals. The use of triangulation, reflexivity, and prolonged engagement enhances the trustworthiness of the findings. This section will explain how the thesis addresses these criteria in the context of hospital IM and the influence of surgeons on the OTs.

3.3.1 Credibility

Credibility in qualitative research refers to how well the findings represent reality or truth as constructed by the participants (Lincoln and Guba, 1985). It is

analogous to internal validity in quantitative research and addresses the congruence between the conclusions and reality (Stahl and King, 2020). In this thesis, several strategies have been employed to ensure credibility:

First, this research used methodological triangulation by combining different data collection methods: semi-structured interviews, direct observations in the OT, and document analysis. For instance, observations in the OT revealed how surgeons reacted when PPIs were unavailable, corroborating the interview data where surgeons and logisticians discussed their influence on inventory decisions. Additionally, data triangulation was achieved by gathering information from multiple sources: surgeons, logisticians, and C-level executives from four hospitals. This repeated pattern of influence from different stakeholders across different methods and contexts supports the credibility of the findings.

Second, after conducting and transcribing the interviews, the participants were invited to review the transcriptions and preliminary findings to ensure the accuracy of the data. This process allowed the surgeons, logisticians, and C-level executives to verify that their perspectives were accurately represented, further supporting the credibility of the research.

Ultimately, the research provides detailed accounts of IM practices, from the logistic constraints to the surgeons' demands for specific PPIs during surgeries. By offering rich, contextualized descriptions of how hospitals manage inventory and how stakeholders interact, the findings become more vivid and relatable to readers.

3.3.2 Transferability

It refers to how the findings can be applied to other settings or contexts. In qualitative research, the responsibility for transferability lies with the reader rather than the researcher (Stahl and King, 2020). However, researchers can enhance transferability by providing thick descriptions that allow readers to make informed decisions about the applicability of the research to their contexts (Lincoln and Guba, 1985)

This research involves four hospitals representing different funding mechanisms (public and private funding) and organisational contexts (hospital-based versus non-hospital-based). The thesis offers a comprehensive understanding of the environment in which the research occurred by providing detailed information about each hospital's structure, funding, and challenges in IM. This level of detail allows other researchers and practitioners to assess whether the findings could apply to similar healthcare settings.

The findings highlight the differences and similarities between public and private funded hospitals regarding inventory management practices, particularly surgeon influence and logistics strategies. For example, in private-funded hospitals, surgeons often have more control over inventory decisions, whilst publicly-funded hospitals tend to prioritize cost-saving measures. These comparative insights help readers identify contexts where the findings might be relevant or transferable.

3.3.3 Dependability

It relates to the consistency of the research process. It addresses whether the findings are consistent and could be replicated by other researchers using the same data collection and analysis methods (Lincoln and Guba, 1985). A clear audit trail has been maintained throughout the research process, documenting the steps taken in data collection, analysis, and interpretation. The coding process followed Saldaña's (2016) methodology, starting with first-order categories, developing second-order themes, and finally aggregating dimensions of power. Tables 4.1 and 4.2 in the thesis show how the coding process evolved from raw data to broader conceptual insights, ensuring the research process is transparent and traceable (See Section 4.4).

The author engaged in reflexive self-analysis throughout the study, critically reflecting on how personal biases and assumptions may have influenced data collection and interpretation, as proposed by Pillow (2003). For example, in the OT observations, the author was mindful of the influence of preconceived notions about the surgeons' authority and tried to remain neutral when interpreting their actions during surgeries. Reflexive notes kept separating personal

interpretations from the actual observations, strengthening the findings' dependability.

3.3.4 Confirmability

It refers to the objectivity of the research and the extent to which the findings are shaped by the participants rather than the researcher's biases or assumptions (Lincoln and Guba, 1985). By using multiple data sources and methods, the research ensures that the findings are not solely shaped by one type of data or one group of participants (Stake, 2006). The convergence of data from surgeons, logisticians, and C-level executives supports the confirmability of the research, as similar patterns of influence were identified across different stakeholders and methods.

The author practised reflexive auditing by acknowledging biases and assumptions during the research process, as proposed by Pillow (2003). For example, *the author initially expected surgeons to dominate IM in all four hospitals*. However, the author ensured that the findings emerged from the data rather than preconceived notions through systematic data analysis and bracketing. This reflexive process helped maintain the objectivity of the research. Moreover, detailed records of the data collection and analysis process, including coding and categorization, were kept, allowing for an external audit of the research process. This audit trail provides transparency and allows others to follow the steps taken during the research, ensuring that the findings are grounded in the data rather than the researcher's subjective interpretations.

3.3.5 Conclusion

In conclusion, by adhering to the criteria of credibility, transferability, dependability, and confirmability, this thesis demonstrates a high level of trustworthiness (Lincoln and Guba, 1985; Saldaña, 2016; Stahl and King, 2020; Stake, 2006; Yin, 2018). Triangulation, reflexive analysis, and prolonged engagement ensure that the findings accurately reflect the reality of hospital inventory management practices. Detailed descriptions of the research context and transparent documentation of the research process enable readers to assess

the applicability of the findings to other settings. The trustworthiness of this thesis provides a solid foundation for understanding how surgeons influence IM in the OTs, contributing valuable insights to the HCSCM field. This approach, rooted in Lincoln and Guba's (1985) framework, establishes the research as credible, reliable, and transferable within hospital IM, particularly considering the complex dynamics between medical staff and logistics teams during surgeries.

3.4 Reflexivity

The researcher's professional background as the CEO of a large pharmaceutical company in Latin America and the former CEO of one of Colombia's largest medical device distributors and pharmaceuticals had positive and challenging implications for the research process. This experience provided privileged access to the healthcare industry, facilitating strong relationships with key stakeholders, including physicians, hospital administrators, logisticians, and C-level executives. However, it also necessitated a reflexive approach to ensure that prior knowledge and assumptions did not unduly influence the research findings (Pillow, 2003)

As Pillow (2003) discusses, reflexivity requires researchers to balance the benefits of their positionality with the potential biases that might arise from it. In this context, the researcher's professional role enabled access to critical data sources and high-level hospital decision-makers. The relationships developed over the years allowed access to observe sensitive operations in the OT, interview top medical officers, and review confidential documents IM Key KPIs and Surgical Tray configurations. These relationships enhanced the credibility of the data by facilitating in-depth interviews and detailed observations.

The researcher's professional standing also allowed for a comprehensive understanding of the internal workings of hospitals. Engaging in discussions with C-level executives and logisticians on equal footing resulted in candid conversations about IM challenges. For example, during observations in Hospital A, the researcher witnessed a surgeon expressing frustration when a PPI was unavailable, delaying the surgery, and then patronizing a logistician. This first-

hand observation was invaluable for understanding the real-time dynamics and tensions between clinical and logistical teams.

Whilst these advantages greatly enriched the research, engaging in ongoing reflexive practice to mitigate potential biases was essential. The researcher's long-standing relationships with participants could have led to either being overly sympathetic or critical of specific stakeholders, such as surgeons or logisticians. For instance, due to extensive experience in medical device distribution, the researcher deeply understood the pressures surgeons face when requesting specific devices for surgeries. This knowledge could have predisposed the researcher to align too closely with the surgeons' perspectives, potentially downplaying hospitals' logistical challenges in IM practices.

To address these concerns, several reflexivity strategies were employed to ensure the findings emerged from the data rather than from preconceptions. Reflexive journaling was a key tool used throughout the study. After each interview or observation, the researcher critically reflected on how their position might have influenced the interaction. For instance, questions were raised about whether logisticians were more open due to the researcher's industry experience or whether surgeons felt more comfortable sharing frustrations, knowing that the researcher understood the complexities of medical device management. This reflective process helped maintain an awareness of potential biases, ensuring that the data collected was interpreted with a level of detachment.

In addition to reflexive journaling, triangulation played a crucial role in ensuring the confirmability of the findings. Data from multiple sources—interviews, observations, and document analysis—were used to balance any potential influence of the researcher's positionality. The objective data, such as KPIs and surgical tray configuration documents, established a formal benchmark for evaluating subjective insights. For example, the high rate of surgery cancellations in Hospitals A and B was consistent with interview data from surgeons and logisticians, corroborating the logistical challenges highlighted in the KPI reports.

The researcher's professional background also brought benefits in contextualizing the findings within the broader healthcare supply chain landscape. As a recognized practitioner in supply chain management in Colombia and a lecturer at a leading Colombian business school, the researcher could interpret the data with a depth of expertise that might not have been available to an outsider. Patterns in the hospitals' IM practices—such as the differences in inventory accuracy and surgery cancellation data between public and private funding hospitals—were immediately apparent due to the researcher's familiarity with operational pressures in the industry. This expertise added depth to the analysis by allowing for a more nuanced interpretation of the data.

However, as Pillow (2003) emphasizes, expertise should not overshadow the participants' voices. Whilst the researcher's professional experience provided valuable insights, ensuring that the findings were grounded in the participants' perspectives was crucial. Using a systematic coding process, following Saldaña's (2016) framework, and triangulating data from multiple sources ensured that the results were rooted in the stakeholders' experiences, not the researcher's prior assumptions.

Furthermore, the researcher's industry connections enhanced the depth of the study. These relationships facilitated access to high-level participants, including heads of departments, surgeons, and C-level executives, who provided invaluable insights into IM practice challenges. The observations in the OT, where surgeons voiced their frustrations over unavailable PPIs, were directly linked to the power dynamics that surfaced in interviews with logisticians and executives. This access enriched the data collection process by allowing real-time observation of the tensions between logistical efficiency and clinical demands.

At the same time, the researcher remained reflexive throughout the study, acknowledging the potential influence of their industry expertise. Reflexive journaling and ongoing critical reflection ensured that this professional background did not unduly influence the interpretation of the data. Moreover,

triangulation of data sources, including KPI documents, semi-structured interviews, and observations, ensured that the findings were based on multiple layers of evidence.

In conclusion, the researcher's professional background provided advantages and challenges throughout the research process. The ability to access high-level stakeholders and critical documents significantly enhanced the credibility and depth of the findings. However, the researcher ensured the findings were grounded in the data, not shaped by prior knowledge or industry experience through careful reflexive practice and methodological rigour. This balance of leveraging professional expertise whilst maintaining academic rigour contributed to the study's trustworthiness, offering valuable insights into hospital power dynamics and inventory management practices.

This reflexive approach (Pillow, 2003), combined with triangulation and careful coding, ensured that the research had credibility, dependability, and confirmability, as Lincoln and Guba (1985) defined, providing a robust framework for understanding the complex relationships between surgeons, logisticians, and OT's IM practices.

4 DATA COLLECTION

“Any event that depends on more than a single causal agent is an outcome based on interdependent agents...interdependence exists whenever one actor does not entirely control all of the conditions necessary for the achievement of an action or for obtaining the outcome desired from the action” (Pfeffer and Salancik, 1978, p.40)

4.1 Data collection for the semi-structured interviews

According to Yin, case study data collection follows a formal protocol (Yin, 2018). However, the information that may become relevant is not predictable, and generally, the researcher must review the data collected and continuously ask himself why the events appear as they do. Semi-structured interviews were the main instrument for this research, with three interviewees' questionnaire types (See Appendix K, L and M) for 20 recorded interviews of 60 minutes in Spanish (the native language of Colombia). A description of the interviewees is shown in Table 4-1.

Table 4-1 Description of the interviewees for each case study

Case studies	Questionary types		
	C-level	Surgeons	Logisticians
Hospital A (5)	(2) CEO and Chief Medical Officer	(1) General Surgeon	(2) Supply Chain director and head of the pharmacy
Hospital B (5)	(2) CFO and Chief Medical Officer	(1) General Surgeon	(2) Logistics manager and head of the pharmacy
Hospital C (5)	(2) CEO and Chief Medical Officer	(1) General Surgeon	(2) Logistics manager and head of the pharmacy
Hospital D (5)	(2) CEO and CFO	(1) General Surgeon	(2) Nurse and head of the pharmacy

Source: The author

Then, the interviews were transcribed into Spanish Word documents and imported into the qualitative analysis software NVivo. A brief description of the

hospitals is presented in the following section. Additional information about Colombia's healthcare landscape is given in Appendix Section N.

4.1.1 Case A (Low hospital-based physicians and Private-funded)

Hospital A was a private hospital founded in 1960 with 420 beds, 16 OTs and a surgical output of 80 daily surgeries. Its customers are mainly out-of-pocket patients or patients with private insurance, targeting high-income households. The C-level considers that most of its revenues come from surgical activity focusing on Cancer treatment. Hospital A's benefits to surgeons are its prestigious clinical offices and the fact that it has the most technology, medical devices, and pharmaceuticals available. More than 400 non-exclusive surgeons are essential in the business model, consisting of contracting physicians with a high reputation and bringing high-income patients into the hospital. The location of Hospital A is also important in the business model, as it is near the city's high-income living areas.

In surgery, 70% of the surgery results from urgent events, and 30% are planned surgeries. The location, top-reputed physicians, and good top-of-mind strength have positioned Hospital A as one of the preferred sites for high-income people in the city. Due to its business model, in which physicians are mostly non-hospital based, the surgeons do not have additional cultural and institutional requirements.

4.1.2 Case B (Low hospital-based physicians and Public-funded)

Hospital B is a new project with 330 beds and 11 OTs, and it was founded at the beginning of 2019. The value proposition is centred on the patient and the patient's family. The hospital was designed with areas that help patients recover, like beautiful gardens and rooms that seem more like premium hotel chambers. Hospital B has worked with the Piker Institute in the USA, a model based on eight pillars with a patient centre at its core. The hospital has a high surgical volume, with 60% of its revenues from the OT and 80% from planned surgical procedures. Furthermore, one-third of the physicians have an exclusive contract with the institution.

On the other hand, it was remarkable that Hospital B has outsourced its logistics to a third-party logistics company in charge of the IM and has implemented technology like Automated Dispensing Machines to improve IM performance. Hospital B decided to outsource because it believes hospital logistics and IM are complex and should be outside a clinical institution's core. Therefore, Hospital B started the project in 2017 intending to have the best possible IM practices and performance.

4.1.3 Case C (High hospital-based physicians and Private-funded)

Hospital C is a private, non-profit university in Bogota, founded in 1972. The institution aims to be the healthcare sector leader, creating value for the stakeholders and supporting government initiatives for improving healthcare standards for Colombia and Latin America. It has vast experience in delivering the best clinical outcomes. Some clinical KPIs are well recognized in the medical community as centres of transplants, excellence centres for hip and knee replacements, and nine other excellent care services. The hospital has a strong bond with Johns Hopkins Hospital in the USA.

Hospital C puts quality over cost, bringing over-the-edge technology like robotics for minimally invasive surgery. Furthermore, it was the first hospital and one of the few where the nurse's head is a peer of the medical director. Moreover, they have exclusive contracts with a high number of physicians (more than 70%), and therefore, doctors adopt a strong culture in which serving patients is the institutional creed. Physicians are devoted to their patients. As the Chief medical officer mentioned, *"here is not the place for a life balance between work and personal life. We give our clinical staff the right content to go home and serve their families"*.

Also, it has been accredited by the international JCQA program (Joint Commission of Quality Assurance in the USA) for eleven (11) centres of clinical excellence for managing different procedures or pathologies. It is also accredited by the ICONTEC (Colombian Quality Agency). The research is vast because they are a university hospital, and peer-to-peer academic production is high.

They recently achieved a high result in the Great Place to Work ranking. All the interviewees and the people in the field were proud to work in the institution.

4.1.4 Case D (High hospital-based physicians and Public-funded)

Hospital D was founded in 2010, but before 2010, it was a public hospital sold to a private, not-for-profit organisation. It has been positioned as a high-complexity general hospital focused on adults above 60 with low household incomes. The hospital attends 10% of Bogotá, meaning it serves 900,000 people. It is the largest hospital in Colombia, with 811 beds and 12 OTs. It is also a university hospital well-recognized in the region for research and educating high-level physicians.

Furthermore, it has strived to be perceived as a patient-centred hospital with the best quality for low-income people. Hospital D attracts surgeons who want to learn more due to the complexity and the high volume of surgical cases that can be seen in this type of hospital. The administration has achieved a strong culture of pride and commitment to the organisational culture. According to the interviews, working in Hospital D has a particular value in terms of economics and intangible benefits. The nurse turnover is low compared to other institutions. Hospital D was one of the first hospitals in Colombia to implement IS in the IM practice and has a model with Automated Dispensing Machines and Electronic Records for improving IM performance.

4.2 Observations

This chapter presents the detailed observations conducted by the author between 2019 and 2021 in the operating theatres of four hospitals: Hospital A, Hospital B, Hospital C, and Hospital D. These observations, delayed due to COVID-19 disruptions, focus on how each hospital managed PPI and critical items in surgical departments. Each hospital demonstrated unique approaches shaped by its operational structure, surgeon preferences, and technological capabilities.

4.2.1 Hospital A: Operating Theatre Observations

In Hospital A, a private institution, the author observed that surgeon preferences heavily influenced the hospital's inventory system, complicating efforts to standardize surgical supplies. For example, surgeons often preferred specific instruments and implants for specialized procedures, resulting in high customization in surgical kits. Whilst necessary for complex surgeries, this customisation introduced challenges in maintaining consistent stock levels for all preferred items.

The author observed that the hospital relied on manual inventory checks before surgeries, which posed challenges. Nursing staff were responsible for manually verifying the availability of critical items and PPIs before each procedure. This process was labour-intensive and time-consuming, especially when non-standard items were requested by surgeons, occasionally leading to delays. The absence of an automated tracking system for PPIs resulted in occasional shortages, as the hospital struggled to balance maintaining enough inventory on hand without overstocking expensive, specialized items.

Furthermore, the hospital faced difficulties efficiently managing high-value PPIs such as orthopaedic implants and cardiovascular tools. The demand for these items fluctuated depending on the types of surgeries being performed, and the hospital's inventory system was reactive rather than proactive in forecasting future demand. The author noted that staff often responded to immediate surgical needs rather than preparing based on anticipated demand.

Despite these challenges, the hospital made concerted efforts to ensure the availability of critical items in emergencies. The pharmacy and logistics departments worked closely to prepare surgical kits ahead of time, focusing on critical items that could not afford to run out during procedures. However, the inventory adjustments created inefficiencies, and the reliance on manual processes remained a barrier to smooth operations.

The author observed a strong surgeon-driven approach to inventory use during surgery in Hospital A. Surgeons frequently requested specific instruments and

implants that were not part of the standard inventory, resulting in delays as staff scrambled to locate or prepare the needed items. The lack of alignment between the inventory system and surgeon preferences led to a chaotic environment, with logisticians and nursing staff under pressure to meet surgeon demands. The author noted that this contributed to tension and inefficiency, as the manual processes for handling PPIs and critical items delayed the start of procedures and added stress to the surgical team.

Surgeon preferences and manual oversight heavily influenced Hospital A's approach to managing PPIs and critical items. Whilst efforts were made to ensure the availability of essential supplies, the lack of automation and standardization created challenges in maintaining consistent inventory levels and preventing surgery delays. The hospital could benefit from adopting more automated systems to streamline its IM processes.

4.2.2 Hospital B: Operating Theatre Observations

At Hospital B, the author observed a more structured and standardized approach to managing PPIs and critical items in the OT compared to Hospital A. The hospital had implemented a Vendor Managed Inventory (VMI) system for non-critical items, allowing for more efficient management of routine supplies. This system reduced the stock levels of non-critical items, freeing up space and resources for more critical supplies. The VMI system was particularly effective in ensuring a continuous supply of low-cost items and reducing the burden on the logistics team. However, the system was still evolving, and despite progress, both the logistics team and C-level executives noted that more time was needed to integrate and fully optimize KPIs across all areas. The ongoing implementation of automation was an essential part of this process, with further improvements anticipated once fully operational.

Despite these advancements, the hospital faced ongoing challenges, particularly in the tension between logisticians and surgeons. Whilst there was strong support from C-level executives to standardize inventory processes, surgeons often expressed dissatisfaction, particularly with the limitations of PPIs and the

restrictions they placed. Surgeons were known to be more vocal in their demands for specific items, especially for specialized PPIs like implants and surgical devices, which were not part of the standardized surgical kits. This often led to friction, with some surgeons becoming frustrated and rude toward the logistics team. These tensions arose from a mismatch between the hospital's push for standardization, surgeons' desire for personalized solutions, and their perception that the system compromised their autonomy in choosing surgery materials.

The author also observed that RFID technology played a significant role in ensuring real-time tracking of high-value PPIs and critical surgical instruments. This system immediately identified missing or low-stock items before surgeries, minimizing the risk of stockouts and ensuring that essential supplies were readily available when needed. RFID was central to the hospital's technology-driven solutions, contributing to smoother operations and more efficient management of critical items compared to Hospital A, where similar systems were not yet in place. The RFID system also allowed for advanced confirmation of item availability, providing a more organized and efficient process during surgeries. This contributed to minimizing surgery delays, which is crucial in high-pressure environments where time-sensitive decisions must be made. However, there were some delays and even cancellations of surgeries due to PPIs that didn't appear in the inventory planning and control system and were asked by surgeons.

However, despite the efficiency of RFID and VMI systems, surgeon preferences continued to challenge the hospital's inventory management. For routine items, the VMI system functioned well; however, specialized PPIs often had to be managed on an ad-hoc basis, with the logistics team adjusting stock levels based on upcoming surgeries. This practice of accommodating individual surgeon preferences resulted in occasional stockouts or overstocking of high-cost items, creating inefficiencies within the system. The hospital's ability to manage these exceptions was made more accessible by the semi-automated system, but it still presented challenges in maintaining an entirely smooth operation.

One area where Hospital B did excel was in managing critical items for high-complexity surgeries, such as cardiovascular and neurological procedures. Critical supplies were pre-prepared and stored near the operating theatres, ensuring they were easily accessible during surgery. The logistics team and nursing staff collaboration played a key role in this success, as they worked together to ensure the availability of supplies for these high-stakes procedures. The author observed that the hospital's system for managing critical items was well-organized, and it was crucial in minimizing delays during surgeries requiring specialized materials.

In conclusion, Hospital B's inventory management system demonstrated higher sophistication than Hospital A's, particularly in its use of RFID and VMI systems. These technologies, alongside strong collaboration between the logistics team and clinical staff, enabled the hospital to manage critical items more efficiently, reducing delays and stockouts. However, tensions between the logistics team and surgeons, driven by the latter's preferences for specific materials, continued to challenge the system. Whilst the hospital's IM was more streamlined and operationally effective than Hospital A's, addressing the issue of surgeon autonomy remains a key area for improvement in achieving a fully integrated and efficient IM system.

4.2.3 Hospital C: Operating Theatre Observations

The author observed a highly customized approach to managing PPIs and critical items in the OT in Hospital C. As a private institution with a high hospital-based physician presence, surgeons at Hospital C had considerable influence over the selection of surgical instruments and devices. PPIs, especially high-value items, were tailored to the surgeon's preference but aligned with the clinical guidelines of the institution. The personalization was observed in a group of surgeons depending on different validated clinical approaches to a surgical procedure.

Whilst beneficial for patient outcomes, this high degree of customisation introduced complexities in IM. The hospital employed manual checks for specialized PPIs. The author noted that surgical staff spent considerable time preparing and assembling custom surgical kits, particularly for complex

procedures. Whilst this ensured that surgeons had the exact tools they needed, it also increased the risk of delays if specific items were not readily available.

One of the key challenges the author observed was the balance between maintaining a high level of availability for critical items and minimizing the costs associated with stocking low-turnover items. The hospital's inventory system prioritized critical items, but the high demand for customization often required additional resources to manage the inventory effectively. Whilst the hospital could meet the needs of its surgeons, the reliance on manual processes for certain PPIs limited the efficiency of its operations and was covered with more logistics personnel.

Regarding technology, the hospital relied on manual processes to monitor high-value items, increasing the logistics team's workload. The author observed that whilst the hospital was improving its IM practices, there was still room for improvement, particularly in adopting more automated solutions for managing PPIs.

In Hospital C, the author observed that surgeons had significant influence over the configuration of surgical kits during the surgical procedure. The high degree of customization meant that staff prepared specific instruments based on the surgeon's preferences. This personalization ensured that the surgeons had everything they needed for the procedure, but the reliance on manual preparation led to occasional delays when specialized items were not immediately available. The author also observed that the collaborative atmosphere between surgeons and logisticians helped mitigate these delays, although the system could have benefited from greater automation.

In summary, Hospital C's IM system was characterized by a high level of customization and surgeon influence. Whilst the hospital excelled in providing the specific tools and instruments required for complex surgeries, the reliance on manual processes for PPIs limited its operational efficiency. The adoption of more automated systems could help the hospital streamline its inventory management practices and reduce the risk of delays during surgeries.

4.2.4 Hospital D: Operating Theatre Observations

In Hospital D, the author observed a highly organized and standardized approach to managing PPIs and critical items in the OT. The hospital's inventory management system was semi-automated, with real-time tracking of high-value items using automated dispensing machines technology. This system allowed for precise management of inventory levels, ensuring that critical items were always available when needed.

In the OT, critical items such as surgical instruments, implants, and other PPIs were stored near the surgical suites, allowing immediate access during procedures. The hospital's automated system tracked the location of these items and monitored their usage, ensuring that inventory levels were maintained without manual intervention. The author noted that this level of automation significantly reduced the risk of stockouts and minimized the workload for surgical staff.

Despite the high level of automation, Hospital D occasionally encountered challenges related to surgeon preferences. Whilst the hospital prioritized standardization to reduce costs and improve efficiency, certain surgeons requested specific PPIs for complex procedures. The hospital managed these requests through a collaborative approach, engaging with surgeons to ensure that their preferences were considered while maintaining the IM system's overall efficiency. The standardization was rooted in applying clinical guidelines in which the institution worked. Additionally, the hospital's focus on standardizing surgical kits for standard procedures helped streamline operations and reduce preparation time for surgeries. Regarding cost efficiency, the author noted that Hospital D's semi-automated system allowed for better control over inventory expenses, particularly for high-value items. The hospital's ability to track usage in real time helped reduce wastage and ensured that critical items were used effectively.

The author observed a highly efficient and streamlined process during surgery in Hospital D. The semi-automated dispensing machines ensured that all

necessary items, including PPIs, were ready and available, allowing the surgical team to focus entirely on the procedure without worrying about missing instruments. The real-time tracking of inventory facilitated by automated systems reduced the need for manual intervention, and surgeons operated within a standardized framework that prioritized both clinical needs and operational efficiency. The author observed that the collaborative approach to inventory management, the involvement of surgeons in implementing and adhering to clinical guidelines, and the use of advanced technology resulted in a seamless surgical process.

In conclusion, Hospital D's IM system represented the highest efficiency level among the four hospitals observed. Using semi-automated systems for tracking and managing PPIs and critical items ensured that surgeries proceeded without delays, whilst the collaborative approach to managing surgeon preferences made the standardization process supported by the implementation of institutional clinical guidelines.

4.3 Document analysis

Document analysis provided additional insights, helping to triangulate the data collected from interviews and observations. In addition to the insights gained through direct interaction with participants, hospital documents offered a formal and structured source of data that enhanced the understanding of IM practices, IM performance measurement, and the logistical intricacies of surgical tray management. The analysis of these documents contributed to the overall trustworthiness of the research by offering concrete, objective evidence to support or contrast with the participant-driven data.

4.3.1 Inventory Management KPIs

One of the primary documents reviewed was hospital reports detailing IM KPIs. These KPIs provided a quantitative perspective on the hospitals' operational efficiency in managing inventory, highlighting key metrics that complemented the data gathered from semi-structured interviews and observations. The KPIs assessed included Inventory Turnover of PPIs, Inventory Accuracy of PPIs, and

other metrics related to the availability and effectiveness of inventory management systems. Additionally, the operational costs concerning the hospital's size, specifically the Full-Time Equivalent (FTE) of logisticians, were analyzed, which extended beyond the OT.

In Section 2.3 of the literature review on IM performance, the author observed Inventory Turnover and Inventory Accuracy as key performance indicators; however, Inventory Visibility, as suggested by the literature, was not found in the KPIs (Moons et al., 2019; Rakovska and Stratieva, 2018; Volland et al., 2007). No such data was available from the reviewed documents. The relevant documents were shown to the researcher during presentations or interviews, but the researcher did not have copies. Instead, only notes and voice recordings from the interviews were used. This document analysis was primarily used for triangulation purposes to enhance the trustworthiness of the research, as detailed in Section 3.3. Whilst the KPIs document provided valuable insights, it is important to note that hospital comparisons should be validated with more robust quantitative data. Therefore, the information in Table 4-2 served as a complement rather than a quantitative analysis, and no mixed-methods approach involving quantitative data was employed in this thesis.

Table 4-2 KPIs for IM at the four hospitals

Element or KPIs	Hospital A	Hospital B	Hospital C	Hospital D
Funding orientation	Private	Public	Private	Public
Hospital-based physicians' ratio	Low	Low	High	High
Inventory Turns over a year	12	10	23	22
Inventory Accuracy	90%	92%	99%	98%
Surgery Cancellation	High	High	Low	Low
Availability Internal Appraisal (1 to 10)	7	6	8,5	8
FTE in IM related to beds.	0,16	0,16	0,4	0,09

Source: The author

4.3.2 Surgical Tray Configuration Documents

Another important set of documents reviewed pertained to the configuration of surgical trays. These documents outlined the contents of surgical kits, trays, and

packages, which were pre-assembled based on the type of surgery and the surgeons' preferences. The analysis of these documents revealed critical insights into how inventory decisions were made and how the preferences of individual surgeons challenged standardization efforts.

Tray Standardization vs. Customization: Documents showed that whilst hospitals attempted to standardize the contents of surgical trays to optimize stock levels and reduce variability, surgeon-specific requests often disrupted these efforts. The trays, especially those used in complex surgeries, frequently included PPIs that were not part of the standard inventory.

PPI: The configuration documents detailed the specific PPIs surgeons chose for procedures. These documents highlighted the tension between the hospital's desire for standardization and the need to cater to the preferences of influential surgeons. Surgeons often requested modifications to the trays, insisting on using specific brands or models of medical devices, which created challenges for inventory management and procurement departments.

The financial impact of non-standard trays was also apparent in the documents. Customizing trays according to surgeons' preferences increased hospital costs, particularly when expensive, single-use items were included at the surgeon's request. This finding aligned with the concerns raised by logisticians and C-level executives during interviews about balancing clinical needs with financial constraints.

4.3.3 Role of Document Analysis in Triangulation

The analysis of these documents provided a concrete, operational perspective on the hospital's IM practices. Combined with the semi-structured interviews and the observations, the documents gave a more comprehensive understanding of how surgeons influenced IM systems. Moreover, the document analysis complemented the interview findings, where logisticians, surgeons, and C-level executives described their influence on inventory practices. For example, the stockout reports aligned with surgeons' frustrations over unavailable PPIs, whilst the tray configuration documents supported logisticians' claims about the

challenges of maintaining standardized inventory levels in the face of surgeon demands.

Furthermore, observations in the operating theatre showed how surgeons interacted with surgical trays, often requesting specific items or expressing dissatisfaction when their preferred instruments were missing. The configuration documents provided a detailed blueprint of these trays, which helped explain why certain items were present or absent during surgeries.

Analyzing KPIs and surgical tray documents provided critical insights into hospitals' operational challenges in managing inventory. The KPIs revealed areas where logistical strategies were misaligned with practical outcomes, particularly concerning stockouts and inventory turnover. Meanwhilst, the tray configuration documents illustrated how surgeon preferences frequently disrupted standardization efforts and increased costs.

These documents reinforced the findings about the power dynamics between surgeons and logisticians. Whilst logisticians aimed to optimize IM through standardization and cost control, surgeons exercised significant influence over the procurement and configuration of surgical supplies. This dynamic created an ongoing tension between the hospital's strategic goals and the practical realities of surgical care.

Document analysis was a key component of this research, providing valuable insights into the formal structures and strategies hospitals use to manage inventory. The analysis of KPIs and surgical tray configuration documents revealed the operational challenges hospitals face in balancing standardization efforts with the influence of surgeons, particularly in the context of high-cost PPIs. This triangulation of data sources — semi-structured interviews, observations, and documents — strengthens the overall trustworthiness of the findings, as seen in Section 3.3, and provides a robust foundation for understanding hospital IM practices.

4.4 The Coding Process

The analysis in this study followed a structured qualitative coding process, as proposed by Saldaña (2016). This method emphasises the iterative development of codes, moving from initial data coding to more abstract categories and finally to aggregated dimensions or themes that encapsulate the central findings of the research.

The coding process was conducted in three distinct stages. First, “first-order codes” were identified through open coding, focusing on capturing the explicit and direct statements from interviewees and observational data. This initial phase emphasised staying close to the participants’ language and experiences, ensuring the issues raised during data collection were reflected. Next, these first-order codes were systematically grouped into second-order codes named categories, representing broader patterns. This stage required constant comparison between the first-order codes and emerging categories to ensure that significant relationships were identified and accurately reflected in the analysis. Finally, the second-order codes (categories) were further consolidated into aggregated dimensions known as themes (Saldaña 2016). These themes represent the overarching concepts that provide theoretical insights into the research questions, particularly the influence of hospital funding mechanisms and hospital physician contracts on IM practices.

This structured approach allowed for a robust analysis grounded in the data whilst also providing the flexibility to develop deeper insights into the dynamics of hospital IM practices. The following sections outline each stage of the coding process in more detail, including examples of first-order codes, categories (second-order codes), and themes (aggregated dimensions) identified throughout the analysis. The interview data were coded according to Saldaña's (2016) methodology and clustered into first-cycle codes. Then, a second iteration was carried out, and second-cycle codes appeared and were labelled as “Category”. Some of them were regrouped into themes used to answer the research questions. Finally, using Nvivo, a software for qualitative research (Bryman and Bell, 2015), the author managed, analysed, and clustered the data

into first-cycle codes, categories, and themes, which were instrumental for the findings presented in Chapter 5.

4.4.1 Power dimensions codes

In this research, power dimensions were deeply explored through the lens of RDT (Pfeffer and Salancik, 1992), which defines power as the ability to influence others by some definitions of power proposed by Pfeffer (1992): Getting people to do things otherwise won't do it, changing the course of events, influencing behaviour and overcoming resistance. Power is also defined in the RDT as the ability to control key resources (Pfeffer and Salancik, 1978). Using these power definitions, the interviews and observations were coded into first-cycle codes that reflect behaviours and statements indicating the influence of surgeons and or control over resources within the hospital IM practices. The first-cycle codes, second-cycle codes and themes that emerged are shown in **¡Error! No se encuentra el origen de la referencia..** Power of surgeons is a theme.

Following Table 4-3, the subsequent analysis phase involved grouping the first-order codes into second-order codes or categories. This step helped consolidate the data from the initial coding phase into broader categories that capture power dynamics within hospital IM. The researcher identified recurring patterns across the data that reflect the interactions and influence dynamics between surgeons and logistics staff by organising the first-order codes into second-order categories.

The data was thoroughly reviewed before grouping the first-cycle codes into categories. This revision process involved reading through all the direct quotations and observations to ensure that the participants' voices were accurately represented. First-cycle codes emerged directly from the data during this revision, essentially descriptive labels that encapsulated the participants' statements and observations. These first-cycle codes were grounded in the language and experiences of the interviewees, ensuring that the research remained firmly connected to the participants' lived experiences and provided a true reflection of the power dynamics at play.

Once the first-cycle codes were established, the researcher carefully reviewed them to identify similarities and differences across the various codes. This iterative process allowed the recognition of patterns within the data that helped highlight how surgeons interact with logistical staff and influence IM practices. Through this careful examination, patterns emerged that pointed to broader concepts of power and resistance, providing the basis for the second-order codes.

The second-cycle codes, or categories, were drawn from the SLR conducted in Chapter 2, where they were identified as significant elements in understanding power dynamics in HCSCM. These categories were then adapted to the data, specifically relating to the "Power of Surgeons" theme.

As an example, the data *"Surgeons often request items that are not part of our pre-approved list"* and *"Surgeons come with their wish list"* were grouped into the first-cycle code "Surgeon's Wish List" (B1), reflecting the power surgeons hold over the inventory process through their influence on the selection of non-standard items. These first-cycle codes were then grouped with related first-order codes, such as B2 - "Patient's safety as a contingency argument against new IM ideas" and B3 - "Surgeon's preferred items," which displayed similar patterns. Together, they formed the second-cycle code, or category, "Changing the course of events" (Code B), highlighting how surgeons' demands and preferences disrupt established IM practices and influence the overall decision-making within the hospital's inventory system.

Similarly, the data *"Logistics might set rules, but when a surgeon requests something, the rules bend a little"* and *"Every time they (surgeons) are complaining because they don't accept standardized trays"* were grouped under the first-cycle code "Deliberately Non-compliance with IM Standard Procedures" (A1), emphasizing the power surgeons exert to deviate from standardized procedures and impose their preferences. A1 was then grouped with related first-order codes, such as A2 - "Doing what surgeons want" and A3 - "Doing irrational things," which shared similar patterns. These codes formed the second-cycle code or category "Getting people to do things they otherwise wouldn't do it" (Code

A), illustrating how surgeons' influence leads to actions that undermine established IM protocols and disrupt operational efficiency.

These second-order categories were then further grouped into the overarching theme of "Power of Surgeons in the IM System", which helped highlight how surgeons' preferences, resistance to standardization, and strategic influence over IM practices shaped hospital IM systems. The theme of "Power of Surgeons in the IM System" also reflects the definitions of power described in the literature (Pfeffer, 1992)

By examining these second-order categories and aligning them with the power dynamics described in the SLR, the research was able to map out the complex ways in which surgeon power influences IM practices. This categorization helped identify the core areas where surgeons exercise influence and contribute to understanding how surgeons' power (re) shapes IM processes in hospital settings.

Table 4-3 Codes for the theme “Power of Surgeon in the IM system”

Data (some examples for comprehension purposes)	First-cycle codes	Categories (Second-cycle codes)	Themes (aggregated dimensions)
<i>“Logistics might set rules, but when a surgeon requests something, the rules bend a little” – Surgeon Hospital A.</i>	Deliberately non-compliance with IM standard procedure (A1)	Getting people to do things otherwise won't do it (A)	Power of Surgeons in the IM system (E)
<i>“Sometimes the official inventory in the tray doesn’t have what I need, so I bypass the system and request it directly” – Surgeon Hospital C.</i>			
<i>“It’s common for us just to ask logistics for something and expect them to make it happen, even if it’s not a part of the standard stock” – Surgeon Hospital B.</i>	Doing what surgeons want (A2)		
<i>“We are often forced to make last-minute changes when doctors request non-standard items, causing delays and challenges for the logistics team”. Logistician Hospital A</i>			
<i>“Surgeons often request items not part of our pre-approved list, and we must find ways to supply them, even if it disrupts our inventory system”. Logistician Hospital D.</i>			
<i>“Every surgical speciality requires different tools, and we don’t have clear rotation histories, making it difficult to predict their needs” – Logistician Hospital B.</i>			
<i>“When a surgeon urgently requests a PPI for surgery, we must prioritise it above all other inventory considerations” – Logistician Hospital A</i>			
<i>“Occasionally, we realise that a product isn’t available, and we have to request it right away, even if it wasn’t initially planned”. – Surgeon Hospital D.</i>	Doing irrational things (A3)		
<i>“Surgeons play a strategic role in deciding what we invest in for critical surgical supplies” – C Level Hospital A.</i>	Surgeon’s wish list (B1)	Changing the course of events (B)	
<i>“We rely on surgeons’ insights to guide our strategic inventory decisions, particularly for specialised equipment” – C Level Hospital C.</i>			
<i>“Surgeons come with their wish list, and we (Logistics) must bring them whatever they want. They have no restrictions, which is a talent attraction argument” – Logistician Hospital A.</i>			

Data (some examples for comprehension purposes)	First-cycle codes	Categories (Second-cycle codes)	Themes (aggregated dimensions)
<i>"I need to feel comfortable with the type of products and the OT, and I am also bringing patients. What is the problem then for demanding my preferred products and asking logistics always to have availability?"</i> – Surgeon Hospital A.	Surgeon's wish list (B1)	Changing the course of events (B)	Power of Surgeons in the IM system (E)
<i>"Our input isn't just for one surgery but all the procedures"</i> – Surgeon Hospital D.			
<i>"How many people are you willing to affect according to your proposal (related to inventory)? That is a moral question, and my question to them is, what if it is your mother, your wife or your daughter?"</i> – Surgeon Hospital C.	Patient's safety as a contingency argument against new IM ideas (B2)		
<i>"Surgeons often have different preferences for medical supplies, and every surgeon is a different world"</i> – C level Hospital A.	Surgeon's preferred items (B3)		
<i>"We have our preferences, and they are usually followed without too much question, especially for key surgeries"</i> – Surgeon Hospital B.			
<i>"Inventory decisions are often influenced by the surgeons' need for specific items during surgeries, which may not align with our cost-saving goals"</i> – C level Hospital B.			
<i>"Surgeons' clinical power means we must be flexible in meeting their needs, even if it disrupts our supply plans"</i> – C Level Hospital B.			
<i>"Surgeons are the ones determining what is critical for any given surgery, and that can change from one procedure to the next"</i> – Surgeon Hospital C.			
<i>"Surgeons have significant influence over what we procure, and their strategic decisions impact the long-term supply chain"</i> – Logistician Hospital B.			
During the observation period, a critical incident occurred in which a surgeon became visibly upset because a Preferred Physician Item (PPI) that he had requested for surgery was not available. The surgeon expressed frustration toward the logistics staff, stating, <i>"We cannot proceed without this device, and it's unacceptable that it's not here".</i> – Observation in Hospital C.	Surgeons are complaining about the Inventory System (C1)	Influencing behaviour (C)	
<i>"Every time they (surgeons) are complaining, because again we prepare a standardised tray with certain products, but they don't accept them and want their special items"</i> – Logistician Hospital B.			

Data (some examples for comprehension purposes)	First-cycle codes	Categories (Second-cycle codes)	Themes (aggregated dimensions)
<i>“We haven’t decreased our inventory levels due to the fear of being patronised by the surgeons”</i> – Logistician Hospital A	Patronizing the logisticians (C2)	Influencing behaviour (C)	Power of Surgeons in the IM system (E)
<i>“Surgeons’ preferences play a significant role in determining what we stock, and we must be flexible to meet the patient’s needs during critical operations”</i> – Logistician Hospital C.	Medical arguments over inventory management ideas (C3)		
<i>“If a surgeon asks for something, even if it’s outside protocol, we do our best to deliver it because their clinical expertise is critical”</i> – Logistician Hospital D.			
<i>“Our basic strategy is to become more competitive by standardising procedures and using the same type of products. This strategy is based on efficiency through volumes”</i> – Logistician Hospital D.	Resistance toward standardization (D1)	Overcoming resistance (D)	
<i>“We often have to deal with exceptions in the supply chain to satisfy the specific demands of surgeons during surgeries”</i> – Logistician Hospital C.			
<i>“We’re always pushing against the idea of a ‘one-size-fits-all’ inventory because our procedures require custom solutions”</i> – Surgeon Hospital C.			
<i>“Surgical departments require different items, which makes it nearly impossible to have a standard inventory across all specialties”</i> – Logistician Hospital B.			
<i>“Standardisation is difficult when surgeons continually request items outside the typical inventory”</i> – C Level Hospital A.			
<i>“Every surgeon has their preferences, so maintaining standard inventory practices is nearly impossible”</i> – C Level Hospital C.			
<i>“I have tried to standardise some procedures, like a urology laparoscopy. But we have 42 urologists, and every one of them works independently. They are not organised as a group so that a surgeon can use a laparoscopic instrument x with a catheter y, a suture z, and another surgeon with a completely different configuration, so you have many equivalent surgical procedures”</i> – C-level Hospital A.			

Source: The author

4.4.2 Interests' dimensions

In Section 2.5.2 of the SLR, the interests of physicians were explored within the context of legitimacy and professionalism. These interests are crucial in shaping their behaviour, mainly how they interact with IM systems. Physicians, especially surgeons, have various professional and personal interests that influence their decisions regarding the selection and use of medical supplies. These interests often include the desire to maintain professional autonomy (Freidson, 1999; Starr, 1982), ensure patient safety (Doolin, 2004), enhance their reputation (Freidson, 1999; Starr, 1982; Tasselli, 2015), and optimize clinical outcomes (Currie et al., 2015; Kumar et al., 2022), all of which can impact their engagement with the IM system. These interests were grouped into second-cycle codes or categories in this analysis phase to understand how surgeons' priorities influence hospital IM practices. The first-cycle codes, second-cycle codes and themes that emerged are shown in Table 4-4.

The first-cycle codes related to surgeons' interests were grouped into broader categories that reflect different patterns across the data. This categorization was informed by the conceptual framework from the SLR, where three key areas of interest were identified: patients' interests, reputation-building, and cost-related interests. These categories, formed from a combination of first-order codes, gave a more structured understanding of how surgeons' personal and professional interests shaped hospital inventory management practices.

As an example, the first-cycle code "What is best for patients" (F1), which reflects surgeons' prioritization of patient welfare in inventory decisions, was grouped under the second-cycle category "Representing patient's interests" (Code F). This concept captures how surgeons' professional ethos—emphasizing providing the best care—shapes their engagement with the IM system. For instance, in Hospital A, the idea that physicians should have the autonomy to choose what is best for their patients, as stated by a logistician, underscores the surgeon's influence in deciding inventory items based on their clinical judgment, even if it challenges standard procedures. Similarly, the code "Taking care of the patient's relationship" (F2) emerged, showing how surgeons' focus on maintaining a

positive relationship with their patients sometimes leads to a preference for non-standard or higher-cost items.

Furthermore, the first-cycle code “Surgeon’s preferences” (G1), which describes individual surgeon choices for specific products, was grouped under the category “Experience with a particular product” (Code G). This reflects how surgeons’ experiences with specific products can influence decisions about what to use in the operating theatre, sometimes overriding standardized inventory protocols. For example, a logistician in Hospital B noted that the product portfolio was extensive because surgeons had different preferences shaped by their medical school experiences. This practice was shared across the hospitals, but it became particularly evident in settings where standardization efforts were less successful, often due to solid surgeon resistance.

These categories of interest—patient welfare, reputation-building, and preferences for specific products—highlight the complex interplay of personal, professional, and institutional motivations that drive surgeon behaviour within the IM system. The findings suggest that surgeons’ interests, whilst often aligned with patient care goals, can conflict with the standardization efforts to improve operational efficiency (Freidson, 1999; Sun, 2021). This tension illustrates the dynamic nature of healthcare SCM, where multiple interests and motivations must be balanced to optimize the system’s functioning.

Table 4-4 Codes for the category “Surgeons’ interests”

Data (some examples for comprehension purposes)	First-cycle code	Categories (Second-cycle code)	Theme (Aggregated dimension)
<i>“Free clinical practice from physicians, where the surgeon can choose what is best for his patient, according to his criteria and not limit him, we as an institution believe that is the best”</i> – Logistician.	What is best for his patient (F1)	Representing patient's interests (F)	Interest of Surgeons in the Inventory System
<i>“I am risking the patient's relationship with the narrow portfolio of products of this institution”</i> – Surgeon.	Taking care of the patient's relationship (F2)		
<i>“I think that we work on continuous improvement and the best clinical outcomes for the patients, and we can measure it”</i> – C-level.	Continuous improvement and standardization protocols for patient's clinical outcomes (F3)		
<i>“We depend on the surgeon's likes some of them use of brand A, others from brand B”</i> – Logistician.	Surgeon's preferences (G1)	Experience with a particular product (G)	
<i>“The product portfolio has many options because they (surgeons) also have behind the academia. That surgeon learnt in med school A, the other one in med school B, and the other one is from med school C”</i> – Logistician.	Abilities learnt with a particular product (G2)		
<i>“We say to surgeons to use the tray A, B or C, but they respond that they can't know with certainty which trays to use until they are in the OT with the patient”</i> – C-level.	The patient's uniqueness (G3)		
<i>“There is still a long way to the road in orthopaedics, that is not going to be easy, besides the manufacturing representatives have interests and some of them not that clear, and there is a lot of pressure from these physicians”</i> – Logistician.	Interests in the medical devices industry (H1)	Relationship with manufacturing representatives (H)	
<i>“After clinical congresses, they (surgeons) come with new requirements, and... we start to send new purchasing orders”</i> – Logistician	Clinical congresses and summits from the medical devices industry (H2)		
<i>“Surgeons publish in medical journals through payments (grants) from the industry (medical devices and pharmaceutical industries)”</i> – C-level	The medical devices industry funding medical research (H3)		
<i>“We are not focused on costs; we surgeons would like to have the best, and we usually never measure costs”</i> – Surgeon.	Not interested in costs (I1)	Costs (I)	

Data (some examples for comprehension purposes)	First-cycle code	Categories (Second-cycle code)	Theme (Aggregated dimension)
<i>"Our medical units chiefs are accountable for the medical outcome and the patient's safety, and also for the quality of the service, the patients care, the efficiency and costs" – C-level.</i>	Surgeon's accountability for efficiency (I2)		Interest of Surgeons in the Inventory System
<i>"Any product that has not cost/efficiency (clinical outcome) doesn't enter in the hospital" – C-level</i>	Cost/efficiency in the inventory process (I3)		

Source: The author

4.4.3 Inventory system practices codes, and the Surgeons' influence

In this study, the analysis of Inventory Systems was central to understanding the logistical dynamics within hospital OTs. The first-cycle codes were derived from direct quotations and observations, capturing how hospitals manage their inventory systems. These codes were grounded in participants' practical experiences and language, ensuring that the data remained closely aligned with the realities of hospital IM practices. Following this initial coding phase, the first-cycle codes were grouped into second-cycle codes or categories, providing a more structured understanding of how different elements of the IM system interacted, particularly concerning the influence of physicians through their power or interests.

The second-cycle codes for Inventory Planning and Control System (Q), Inventory Physical System (R), and Inventory Information System (S) represent a mix of descriptive first-cycle codes that locate the IM systems or practices as seen in section 2.2, alongside the influence these systems have when interacting with the power of surgeons (Code E) and interests of surgeons (Code J). These second-cycle codes highlight how the IM system is shaped by the complex dynamics of power and interest that physicians exert over the system.

4.4.3.1 Inventory Planning and Control System (Q)

For example, the first-cycle code "Inventory Planning and Control System" (N) describes systems where logistics teams follow inventory replenishment policies and strategies. One interviewee described a system where surgical trays were customized based on expected procedures, ensuring that most surgical procedures were prepared in advance, reducing delays during surgeries. This planning method ensures that inventory is available on time.

However, the power of surgeons (Code E) influences this system. For instance, in Hospital C, a surgeon expressed frustration when certain preferred items were unavailable, stating, *"We cannot proceed without this device, and it's unacceptable that it's not here"* (Observation in Hospital C). This statement

highlights how the surgeon's power in the decision-making process disrupted the established inventory planning and control system. When not aligned with the standardized procedures, Surgeons' preferences directly impact the planned inventory, requiring last-minute adjustments that disrupt the logistical flow.

4.4.3.2 Inventory Physical System (R)

Similarly, the first-cycle code "Inventory Physical System" (O) emerged as representing the physical infrastructure and location of inventory within the hospital. One participant highlighted using consignment inventory for high-value medical devices, allowing hospitals to free up space whilst ensuring that critical supplies are available. This practice describes the inventory management system's physical aspect, as explained in section 2.2.

However, the interests of surgeons (Code J) often interfere with the system's functionality. In Hospital D, a logistician noted, "Surgeons often request items that are not part of our pre-approved list, and we must find ways to supply them, even if it disrupts our inventory system." This reflects how surgeons' interests in accessing specific, often non-standard, items override the structured physical inventory system. The hospital's physical system must be adapted to meet these particular demands, which can lead to inefficiencies in IM.

4.4.3.3 Inventory Information System (S)

The category (S) was derived from the first-cycle code "Inventory Information System" (P), describing the role of technology—or the lack thereof—in managing inventory. One participant emphasized the reliance on human factors in the system, which led to errors due to the absence of automated tracking systems. This first-cycle code emphasizes the limitations of manual or non-integrated systems.

The power of surgeons (Code E) further influences the effectiveness of the inventory information system. As one logistician from Hospital A stated, "Logistics might set rules, but when a surgeon requests something, the rules bend a little." This demonstrates how surgeons' influence in inventory decisions, even in a system reliant on information technology, can result in non-compliance with

established inventory protocols. Surgeons' ability to bypass the information system disrupts its intended function, leading to potential inventory mismanagement and delays.

In summary, the second-cycle codes Inventory Planning and Control System (Q), Inventory Physical System (R), and Inventory Information System (S) are a combination of descriptive first-cycle codes that locate the IM systems or practices and their interaction with physicians' power (Code E) and physicians' interests (Code J). The categorization of these codes illustrates that whilst the IM systems are fundamentally structured around logistical processes, their functionality and success are heavily influenced by the dynamics of power and interests within the hospital environment. The interaction between physicians and the IM system significantly shapes how inventory is managed, emphasizing the importance of aligning physician preferences with standard inventory practices.

Table 4-5 illustrates how the first-cycle codes related to the hospital's inventory management systems (planning, physical, and information systems) are influenced by physicians' power and interests. It demonstrates how these interactions culminate in broader second-cycle categories, providing a deeper understanding of the dynamics between IM practices and physician involvement.

Table 4-5 Interplay Between Inventory System Practices and Physician Influence

Data (some examples for comprehension purposes)	Surgeons' Influence (Power E or Interests J)	First-Cycle Codes	Categories or Second-Cycle Codes (Q, R, S)
"We prepare surgical trays based on expected procedures, but sometimes surgeons request specific items." – Logistician Hospital A	Power of Surgeons (E)	Inventory Planning and Control System (N)	Influencing the Inventory Planning and Control System (Q)
"The logistics team customizes inventory based on surgeons' preferences for specific products." – Logistician Hospital B	Interests of Surgeons (J)		
"Surgeons often request items that are not part of the pre-approved list, and we need to supply them." – Logistician Hospital D	Power of Surgeons (E)	Inventory Physical System (O)	Influencing the Inventory Physical System (R)
The hospital uses consignment inventory for high-value medical devices, ensuring they're available on demand." – Logistician Hospital C	Interests of Surgeons (J)		
"We rely on a manual system, and errors often occur because there is no automated tracking system." – Logistician Hospital A	Power of Surgeons (E)	Inventory Information System (P)	Influencing the Inventory Information System (S)
"Surgeons frequently bypass the inventory system to request non-standard items for surgeries." – Logistician Hospital B	Interests of Surgeons (J)		

Source: The author

4.4.4 Organisational and Environmental codes

The process of categorising first-cycle codes from interviews and observations into second-cycle codes allowed for identifying key organisational and environmental factors influencing IM practices. These contextual elements—specifically the hospital-based physician ratio and funding orientation—emerged during the SLR (Section 2.6) and were crucial in shaping physicians' power and interests within the hospital inventory systems.

This section presents the second-cycle codes related to the hospital's organisational structure and funding mechanisms. The organisational context was primarily defined by the physicians' contract arrangements (hospital-based versus non-hospital-based), whilst the environmental context was shaped by the hospital's funding orientation (private versus public). These two factors emerged as critical elements influencing surgeons' interactions with IM systems and their capacity to affect decision-making processes related to inventory practices.

Section 2.6 of the SLR notes that contextual elements such as organisational structure and funding mechanisms significantly influence how physicians interact with healthcare supply chains and information systems (Nyaga et al., 2015; Issahaku et al., 2021). For example, the higher the ratio of hospital-based physicians, the more likely the hospital's IM practices align with standardised systems, facilitating better logistical integration and more efficient decision-making (Nyaga et al., 2015). Likewise, hospitals' funding mechanisms—whether public or private—affect the flexibility and power surgeons have in making decisions that influence IM practices (Aptel and Pourjalali, 2001).

The following tables (Table 4-6 and Table 4-7) illustrate how organisational and environmental factors influence IM practices by mapping data, first-cycle codes, second-cycle codes, and the broader theme of physician influence (power and interests). It shows the progression from descriptive data to codes and highlights how physician dynamics interact with IM systems.

Table 4-6 Hospital-based physicians ratio and its Coding Process

Surgeon's contract arrangement with hospital	Data (some examples for comprehension purposes)	Theme	Category (Second-cycle code)
Low ratio of hospital-based physicians	<i>"Here, it is like a social club, in which I (a surgeon) have the right to bring my patient here and make the surgery, but I could say that the level of requirements asked is minimal due to the contract type"</i> – C-level Hospital A	Power of Surgeons on the Inventory System (E)	Surgeons' contract context influences the IM practice (Code L)
	<i>"But, with the non-hospital-based physicians, it is not easy that they embrace the model because they have many other points of care in other hospitals, so what their interests are just that the patients go well, so selling this model has been difficult"</i> – C-level Hospital B	Interests of Surgeons in the Inventory System (J)	
A high ratio of hospital-based physicians	<i>"We have had the support of the head of surgery and the head of clinical education for standardizing processes with their group"</i> – C-level Hospital C	Power of Surgeons on the Inventory System (E)	
	<i>"In our hospital, we have support from other surgeons always. There is always someone I can consult and who can guide me"</i> – Surgeon Hospital D	Interests of Surgeons in the Inventory System (J)	

Source: The author

Table 4-7 Funding Mechanism Orientation and its Coding Process

Funding Mechanism Orientation	Data (some examples for comprehension purposes)	Theme	Category (Second-cycle code)
Private-funding orientation	<i>“Everything he told me (a surgeon), I will do it (referring to inventory management). He has been bringing a lot of patients to this hospital and is also a partner of a medical service company that has contracts in the hospital” – Logistician Hospital A.</i>	Power of Surgeons on the Inventory System (E)	Hospital’s funding orientation influences the IM practices (Code M)
	<i>“And the regulator hasn’t even realized of the new publication (medical device new application), we have the responsibility to deliver it to the patient” – C-level Hospital C.</i>	Interests of Surgeons in the Inventory System (J)	
Public-funding orientation	<i>“A few days ago, someone asked me if we would invest in new medical technology, and my response was that if and only if the NHS will pay for it” – C-level Hospital B.</i>	Power of Surgeons on the Inventory System (E)	
	<i>“We need to analyse what is the financial impact of any decision in terms of products and see if the NHS can make the reimbursement, but we also see the benefits of a better quality in terms of clinical outcomes” – C-level Hospital D.</i>	Interests of Surgeons in the Inventory System (J)	

Source: The author.

4.4.5 Summary

Table 4-8 below summarises the codes used in this research. Codes “A” to “D” represent power definitions derived from the literature review (Pfeffer, 1992) and are considered category codes. These second-cycle codes emerged from qualitative data iterations during the empirical work and were grouped under the overarching category "Power of Surgeons" (Code “E”) to understand the dimensions of surgeons’ power better. Similarly, codes “F” to “I” capture patterns related to surgeons’ interests, concepts also derived from the literature review, and grouped into the "Surgeon’s Interests" category (Code “J”). Surgeons’ perceptions of the IM system are captured in "Code K", a concept explored in the literature review as well. These codes deepen the understanding of De Vries’ (2011) framework.

Additionally, codes “L” and “M” are novel contributions to the De Vries (2011) model and theory, exploring how organisational and environmental factors influence the power dynamics of surgeons. These new contextual elements refer to "surgeons’ contract arrangements" (hospital-based or non-hospital-based) and "funding orientation" (private or public). Finally, the influence of surgeons on IM systems, including planning and control, physical systems, and information systems, is captured in codes "N" to "S". Initially, these codes identify the types of inventory systems, which are then further analysed through subsequent iterations to determine how the system may have been (re)shaped by surgeons’ actions and preferences.

Finally, codes "T" to "Y" are first-cycle descriptive codes used to capture information related to IM KPIs and general descriptions of the hospital (Code "Z"), as presented in Section 4.1. Codes T to Y, explained further in the document analysis section (4.3), were employed solely to enhance the trustworthiness of the research, as discussed in Section 3.3.

Table 4-8 Codes used in the research

ID	Code	Elemental Method, type of code	Source	Reference in Chapter
A	Getting people to do things otherwise will not do it	Category, second-cycle code	Chapter 2 - SLR	2.5.1
A1	Deliberately Non-compliance with IM standard procedures	First-cycle code	Emerged	4.4.1
A2	Doing what surgeons want	First-cycle code	Emerged	4.4.1
A3	Doing irrational things	First-cycle code	Emerged	4.4.1
B	Changing the course of events	Category, second-cycle code	Chapter 2 - SLR	2.5.1
B1	Surgeon's Wish List	First-cycle code	Emerged	4.4.1
B2	Patient's safety as a contingency argument against new IM ideas	First-cycle code	Emerged	4.4.1
B3	Surgeon's preferred items	First-cycle code	Emerged	4.4.1
C	Influencing behaviour	Category, second-cycle code	Chapter 2 - SLR	2.5.1
C1	Surgeons are complaining about the Inventory System	First-cycle code	Emerged	4.4.1
C2	Patronizing the logisticians	First-cycle code	Emerged	4.4.1
C3	Medical argument over inventory management ideas	First-cycle code	Emerged	4.4.1
D	Overcoming resistance	Category, second-cycle code	Chapter 2 - SLR	2.5.1
D1	Resistance toward standardization	First-cycle code	Chapter 2 - SLR	2.5.1
E	Power of Surgeons in the IM System	Theme	Built from categories (A to D)	2.4.1 and 2.5.1
F	Representing patient's interest	Category, second-cycle code	Chapter 2 - SLR	2.5.2
F1	What is best for patients	First-cycle code	Emerged	4.4.2
F2	Taking care of the patient's relationship	First-cycle code	Emerged	4.4.2
F3	Continuous improvement and standardization protocols for patient's clinical outcomes	First-cycle code	Emerged	4.4.2
G	Experience with a particular product	Category, second-cycle code	Chapter 2 - SLR	2.5.2.

ID	Code	Elemental Method, type of code	Source	Reference in Chapter
G1	Surgeon's preferences	First-cycle code	Emerged	4.4.2
G2	Ability learnt with a particular product	First-cycle code	Emerged	4.4.2
G3	The patient's uniqueness	First-cycle code	Emerged	4.4.2
H	Relationship with manufacturing representatives	Category, second-cycle code	Chapter 2 - SLR	2.5.2.
H1	Interests in the medical devices industry	First-cycle code	Emerged	4.4.2
H2	Clinical congresses and summits from the medical devices industry	First-cycle code	Emerged	4.4.2
H3	The medical devices industry is funding medical research	First-cycle code	Emerged	4.4.2
I	Representing costs interest	Category, second-cycle code	Chapter 2 - SLR	2.5.2.
I1	Not interested in costs	First-cycle code	Emerged	4.4.2
I2	Surgeon's accountability for efficiency	First-cycle code	Emerged	4.4.2
I3	Cost/efficiency in the medical model	First-cycle code	Emerged	4.4.2
J	Interest of Surgeons	Theme	Built from categories F to I	2.4.2 2.5.2
K	Surgeon's perceptions of the IM practices	Category, second-cycle code	Chapter 2 - SLR	2.5.3
L	Surgeon's contract context influences the IM practices	Category, second-cycle code	Chapter 2 - SLR	2.6.1
M	Hospital's funding orientation influences the IM practices	Category, second-cycle code	Chapter 2 - SLR	2.6.2
N	Inventory Planning and Control system	Descriptive, first-cycle code	Chapter 2 - SLR	2.2
O	Inventory Physical system	Descriptive, first-cycle code	Chapter 2 - SLR	2.2
P	Inventory Information system	Descriptive, first-cycle code	Chapter 2 - SLR	2.2
Q	Influencing the Planning and control of IM practices	Category, second-cycle code	Chapter 2 - SLR	2.2 2.5.1 2.5.2
R	Influencing the IM Physical system	Category, second-cycle code	Chapter 2 - SLR	2.2 2.5.1 2.5.2

ID	Code	Elemental Method, type of code	Source	Reference in Chapter
S	Influencing the IM Information System	Category, second-cycle code	Chapter 2 - SLR	2.2 2.5.1 2.5.2
T	Inventory turns per year.	Descriptive, first-cycle	Chapter 3	2.3 3.2.4
U	Inventory accuracy	Descriptive, first-cycle	Chapter 3	2.3 3.2.4
V	Surgery Cancellation	Descriptive, first-cycle	Chapter 3	2.3 3.2.4
W	FTE in the IM practices	Descriptive, first cycle	Chapter 3	2.3 3.2.4
X	Inventory's Qualitative appraisal	Descriptive, first-cycle	Chapter 3	2.3 3.2.4
Y	IM performance	Category, second-cycle code	Built from codes T to X	2.3 3.2.4
Z	Hospital's characteristics	Descriptive, first-cycle	General description	4.1

Source: The author

5 FINDINGS

5.1 Case A (Low hospital-based physicians and Private-funded)

5.1.1 The power of surgeons in the Inventory System

According to the findings, surgeons in Hospital A possess substantial power within the hospital's inventory management system, which can be categorized as **High**. This influence is evident through their considerable control over resources, particularly in procuring and customising PPI. Surgeons in Hospital A can demand specific products based on individual preferences, even when these requests exceed standard logistical protocols. As interviews indicate, the logistical staff frequently adapt inventory lists and procurement plans to align with surgeons' demands, a practice noted in both interview and observational data. The hospital's strategic approach to attracting top surgeons further underscores this power dynamic, which grants them substantial autonomy in inventory selection.

Surgeons' ability to influence inventory stems mainly from their critical role in patient attraction and revenue generation. Their influence on patient flow translates directly into financial gains for the hospital, reinforcing a system where logistical and C-level teams prioritize surgeons' preferences. As highlighted in interviews, surgeons are often seen as integral to the hospital's success; thus, the administration accommodates their specific requirements without imposing significant restrictions. This flexibility permits surgeons to customize surgical trays and request particular products they deem essential, allowing them to shape inventory management according to their clinical needs and personal preferences.

This dynamic notably challenges standardization efforts in Hospital A. Whilst standardization is a common IM goal to streamline processes and reduce costs, Hospital A's diversity of surgeon preferences heavily disrupts these efforts. Document analysis and logistics interviews show repeated instances where attempts to implement standardized surgical trays have failed. Surgeons resist

these standardization efforts, preferring to tailor their setups for each procedure. For example, a C-level executive cited challenges in unifying trays for specific departments, such as urology, due to each surgeon's insistence on having unique configurations. This resistance leads to a system where each surgeon effectively manages their inventory preferences, resulting in inefficiencies within the supply chain.

Furthermore, Hospital A surgeons are central in strategic procurement decisions, especially concerning high-value PPIs. Their influence in selecting these items is backed by the hospital administration's reliance on their expertise, reflecting the critical nature of their input in inventory management strategy. Interviews with logisticians and document analysis confirm that surgeon preferences heavily shape procurement choices, and, in some cases, standard procurement KPIs are adjusted to meet surgeons' demands. This adjustment process further demonstrates surgeons' influence, as performance metrics in inventory management adapt based on surgeon feedback rather than standardized goals. The logistical team's passive compliance with these adjustments, noted in observations, reinforces the surgeons' dominant role in decision-making.

Surgeons' influence is also evident in their daily interactions with logistics staff. Logisticians describe a culture of deference where they are “trained for not saying anything and not complaining,” reflecting the high power surgeons wield in shaping inventory policies and team behaviours. This passive compliance by logistics staff indicates a power dynamic where surgeons' authority goes unchallenged, further disrupting inventory standardization and complicating logistics planning. Observations also highlight how logisticians frequently adjust inventory protocols, demonstrating surgeons' pervasive impact on hospital operations.

Finally, the hospital's leadership approach to recruiting top-tier surgeons plays into this dynamic. Interviews reveal that the administration grants surgeons unrestricted control over inventory as a recruitment and retention strategy. This policy, which positions surgeons as key stakeholders with considerable decision-making authority, reinforces a high-power structure that aligns with Hospital A's

revenue-centric model. Surgeons' role in driving patient inflows amplifies their bargaining power, as their autonomy in inventory preferences is linked to hospital profitability. This influence results in substantial logistical and financial challenges, as the hospital accommodates varied, high-cost requests that disrupt operational efficiency and challenge efforts toward cost-effective standardization.

In summary, the high power surgeons hold in Hospital A is rooted in their ability to influence procurement, customize inventory, and attract patients, directly impacting hospital revenue. The findings indicate that this influence challenges inventory standardization and logistical efficiency, as each surgeon's preferences dictate inventory practices and often lead to custom configurations that exceed logistical norms. Hospital A's strategy of prioritizing surgeon autonomy as revenue generation cements the high power surgeons possess within its inventory management system, making them critical yet challenging stakeholders in the hospital's supply chain management.

This detailed account, supported by Table 5-1, illustrates that surgeons' influence in Hospital A extends beyond routine operations, shaping strategic procurement decisions and significantly impacting the hospital's IM efficiency.

Table 5-1 Power of Surgeons in Hospital A

Theme	Data Source	Data	Conclusion
Power of Surgeons in the IM System (Code E)	Interviews with C-levels	<i>"As a strategy to attract top talent physicians, here doctors can demand whatever they want, and we must reply that here we would have everything (products)".</i>	Hospital policy enables surgeons to dictate inventory, underscoring their high power.
		<i>"I don't follow the inventory KPIs; how do I measure its performance then? And I know I should be ashamed for this response. It is with the surgeon's complaints".</i>	Inventory performance metrics are often adjusted based on surgeon complaints, reflecting their control over IM evaluation.
		<i>"I have tried to standardize some procedures, like a urology laparoscopy. But we have 42 urologists, and every one of them works independently".</i>	Surgeon autonomy obstructs standardization efforts, highlighting their resistance to inventory protocols.
	Interviews with Logisticians	<i>"Everything he told me (a surgeon), I will do it (referring to IM); he has been bringing a lot of patients to this hospital and is also a partner of a medical service company that has contracts in the hospital."</i>	Surgeons' influence compels logistics staff to comply with their specific requests.
		<i>"The logistics team are resigned... trained for not saying anything and not complaining and being patronized by surgeons".</i>	Surgeons' authority creates passive compliance among logistics staff, indicating a power imbalance.
		<i>"Surgeons come with their wish list, and we (Logistics) must bring them whatever they want. They have no restrictions, which is a talent attraction argument".</i>	Surgeons exercise significant influence over inventory decisions, as logisticians feel obligated to meet all surgeon requests without limitations, allowing them to bypass standard procedures to maintain their preferences.

Theme	Data Source	Data	Conclusion
Power of Surgeons in the IM System (Code E)	Interview with Surgeon	<i>"Logistics might set rules, but when a surgeon requests something, the rules bend a little".</i>	Surgeons can override logistics rules, showcasing their authority over IM.
		<i>"I need to feel comfortable with the type of products and the OT, and I am also bringing patients. What is the problem then for demanding my preferred products and asking logistics always to have availability?".</i>	Surgeons' product preferences directly impact operational decisions and inventory availability.
		<i>"Standardization might help logistics, but every case is different. My patients need specific tools, and I'm not willing to compromise just for convenience".</i>	Surgeons prioritize individual requirements over standardization, emphasizing their control.
	Observations	Observations indicate that inventory adjustments are frequently made to align with surgeon requests, often bypassing standard inventory protocols.	Inventory practices are altered based on surgeon demands, reflecting their influence.
		Observations show logistician reluctance to challenge surgeon requests, leading to passive acceptance of surgeon demands in inventory.	Logisticians' compliance with surgeon demands indicates the high power surgeons wield.
	Document Analysis	Documentation shows frequent updates and adjustments to inventory lists based on surgeon-specific demands. This leads to increased costs and a lack of standardized practices.	Surgeons' customization requests override standardization and increase inventory costs.
		Hospital A's KPI analysis reveals a high inventory turnover rate (12 turns per year) and 90% inventory accuracy, but these metrics are inconsistent and affected by frequent, ad-hoc surgeon requests.	The influence of surgeons, with frequent custom demands, disrupts stable inventory performance, leading to relatively poor KPIs.
		Document analysis shows multiple failed attempts to standardize inventory due to surgeons' refusal to comply with standardized protocols.	Standardization is consistently disrupted by surgeon autonomy, reinforcing their power.

Source: The author

5.1.2 The interests of surgeons in the Inventory System

The interests of surgeons in Hospital A's IM system reflect their prioritization of clinical outcomes and their influence on inventory decisions. As described in Table 5-2, surgeons' interests are diverse, encompassing patient care, familiarity with specific products, and their relationships with industry representatives. The customization of surgical trays, frequently adjusted to meet the individual preferences of surgeons, highlights their focus on procedural precision and patient-specific needs. One surgeon noted, "I prefer tools I'm familiar with, as they improve precision and outcomes during surgery," underscoring the importance of consistency in achieving favourable clinical results.

Relationships with manufacturers and sales representatives also play a critical role in shaping surgeons' interests in the IM system. During surgery, a sales representative was observed engaging in an open and friendly conversation with a surgeon, illustrating these interactions' collaborative and positive nature. This dynamic fosters trust and ensures surgeons remain updated on the latest technological advancements, influencing their preference for specific PPIs. These relationships are a source of information and contribute to decisions around product adoption within the hospital's inventory.

Surgeons' prioritization of advanced tools is further reflected in their inclination toward high-cost PPIs. Whilst aligned with clinical efficacy, this preference introduces financial challenges for the hospital. The cost implications of these preferences reveal an area where surgeons demonstrate a less direct interest in the broader operational and economic aspects of the IM system. A C-level executive remarked, "We focus on attracting top surgeons by allowing them broad control over resources, even at the cost of logistical complexity," indicating that the institution accommodates surgeons' interests despite potential operational inefficiencies.

Hospital A's lack of significant standardization initiatives is another factor tied to surgeons' interests. Efforts to streamline inventory practices are often resisted,

as surgeons prioritize flexibility and tailored inventory setups. This approach aligns with their goal of optimizing care for each patient but challenges the hospital's ability to improve IM KPIs such as turnover and accuracy. Observations show that logistical adjustments are frequently made to accommodate urgent surgeon requests, reflecting their influence in prioritizing clinical over operational interests.

From a patient care perspective, surgeons emphasize the need for timely availability of preferred tools and materials (PPIs), demonstrating their commitment to achieving the best outcomes. Therefore, their interests in IM practices are heavily weighted toward ensuring high-quality, patient-focused care. However, this clinical focus sometimes clashes with the hospital's operational goals, creating tension between customization and standardization.

In conclusion, the interests of surgeons in Hospital A's IM system revolve around clinical outcomes, product familiarity, and collaborative relationships with industry partners. These priorities drive their influence on IM practices but also introduce challenges to financial sustainability and operational efficiency. The hospital's ability to balance these interests with organisational goals remains critical in optimizing its IM system.

Table 5-2 Interests of Surgeons in Hospital A

Interests dimension	Data Source	Data	Conclusion
Interest of Surgeons (Code J)	Interviews with C-levels	<i>"Surgeons publish (medical journals) through payments (grants) from the industry (medical devices and pharmaceutical industries)".</i>	Surgeons' collaboration with the medical and pharmaceutical industries, supported by grants, reflects a dynamic that integrates research funding with clinical advancements, potentially influencing inventory decisions.
		<i>"Patient feedback plays a role in evaluating the efficacy and appropriateness of tools and materials used in procedures".</i>	Incorporating patient feedback into IM decisions fosters accountability and aligns inventory with patient-centred care goals.
		<i>"Surgeons' preferences often stem from their experience with particular brands, which we evaluate alongside clinical guidelines".</i>	Surgeons' brand-specific preferences are incorporated into IM evaluations, ensuring their experience informs decisions whilst maintaining standardization efforts.
	Interviews with Logisticians	<i>"The inventory in the hospital is open; it is as if every patient has a specific requirement, and that is because of the physicians".</i>	The patient's interests mean more inventory levels and more inventory references. This interest in the power of surgeons reshapes the inventory system.
		<i>"Free clinical practice from physicians, where the surgeon can choose what is best for his patient, according to his criteria and not limit him, we as an institution believe that is the best approach".</i>	A free clinical practice means inventory autonomy in the system. The patient's interests reinforce the surgeon's influence.
		<i>"Surgeons come with their wish list, and we (Logistics) must bring them whatever they want. They have no restrictions, which is a talent attraction argument".</i>	The wish list in this hospital is a recruitment argument in hospital A. "No restrictions" gives an idea of the immense power of surgeons in the system.
		<i>"The product portfolio has many options because they (surgeons) also have behind the academia. That surgeon learns in med school A, the other one is from school B, and the other one is from school C".</i>	Different medical schools influence the surgical approach of a patient's case in surgery, translating into a more equivalent inventory.
	Interviews with Surgeon	<i>"We are not focused on costs; we surgeons want the best. We usually never measure costs".</i>	Surgeons respond that their aim is the healthcare of patients and not the financial aspects of the hospital. This declaration invalidates cost-efficiency initiatives in the inventory system.

Interest of Surgeons (Code J)	Interviews with Surgeon	<i>"The success of our hospital has hindered a lot of inefficiencies there (inventory management practices)".</i>	Logisticians recognise the opportunity in inventory management and find it challenging to engage because of the hospital's financial success. The author did not observe a cost orientation in hospital A.
		<i>"I prefer tools I'm familiar with, as they improve precision and outcomes during surgery".</i>	Surgeons' interest in familiarity and reliability drives their preferences for specific inventory items, reinforcing their role in inventory selection processes.
		<i>"Collaboration with suppliers helps us stay updated on the latest medical advancements".</i>	Surgeons' interest in innovation reflects their focus on incorporating advanced tools and techniques to improve clinical outcomes.
		<i>"The availability of my preferred tools is critical to ensure the best patient outcomes".</i>	Surgeons prioritize having their preferred tools readily available, highlighting their interest in aligning inventory with procedural needs and patient care.
	Observations	During surgical procedures, inventory setups varied significantly between surgeons, each utilising customized trays and tools, reflecting the absence of standardization practices.	No standardization initiative was seen during the case study of Hospital A.
		During surgery, a sales representative from a surgical medical devices company was observed engaging in a friendly and open conversation with the surgeon.	This positive relationship underscores the collaborative nature of their interactions, which can shape surgeons' preferences and influence inventory decisions, particularly for physician preference items (PPIs).
	Document Analysis	Inventory turnover is 12 per year, and inventory accuracy is 90%.	Surgeons' focus on customized inventory to meet clinical needs impacts turnover and accuracy, reflecting their prioritization of patient outcomes over operational metrics.
		Customized surgical trays cater to surgeon preferences, reflecting their interest in ensuring procedural precision.	The hospital accommodates surgeons' interest in personalized setups to optimize care despite the operational inefficiencies this creates.

Source: The author

5.1.3 Influencing the Inventory System

The power and interests of surgeons significantly (re)frame Hospital A's inventory system, shaping its operations and decision-making processes. The strong influence of surgeons creates a complex environment where inventory policies prioritize their preferences, often at the cost of standardization and efficiency. This dynamic is reflected in the hospital's high inventory levels and broad portfolio, resulting in logistical challenges and financial implications.

Surgeons' preferences drive customization in surgical trays and inventory, aligning closely with their interests in ensuring procedural precision and patient outcomes. One surgeon emphasized, *"The surgical trays should include not only one type of product but at least three different brands of equivalent products, where the surgeon can feel comfortable, and the hospital can have profits."* Whilst accommodating surgeons, this approach increases inventory variability and complexity, complicating logistics and inventory accuracy. Observations revealed that the scrub nurse's IM during surgery is influenced by the surgeon's demands, often leading to inaccuracies in the system. Logisticians expressed concern, stating, *"Surgeons come with their wish list, and we (Logistics) must bring them whatever they want. They have no restrictions, which is a talent attraction argument"*. Whilst beneficial for attracting top talent, this unrestricted approach contributes to inaccuracies and inefficiencies in inventory practices.

The relationship between surgeons and inventory practices also impacts financial aspects. Surgeons often push for high-cost PPIs that cater to their procedural comfort, increasing costs. The C-level noted, *"We must figure out what to do with so many slow-moving products. We need to work with the surgeon who asked for it or other surgeons and see if it is possible to include it in other procedures"*. This practice illustrates the hospital's struggle to reconcile surgeon-driven inventory demands with cost efficiency.

Standardization efforts are minimal at Hospital A, as observed in the low rate of standardized surgical trays and processes. Logisticians mentioned, *"We only have about 30% of the trays used in surgery standardized"*. Moreover, customized surgical trays named after individual surgeons are common, such as *"Dr. X's tray,"* reinforcing the personalization that surgeons demand. This lack of standardization reflects surgeons' resistance to aligning with institutional protocols, further exacerbating logistical inefficiencies.

The hospital's private-funding orientation and non-hospital-based physicians contribute to surgeons' high power in the inventory system. The C-level described this context as *"a social club"* where surgeons operate with minimal accountability, further weakening efforts to standardize and control inventory practices. These dynamics pressure logisticians, who must navigate surgeon demands whilst managing a complex and reactive inventory system. One logistician highlighted the challenge: *"The fact that it is possible to have this inventory portfolio and each surgeon has possibilities makes it more complex logistically"*.

In conclusion, the interplay of surgeons' power and interests in Hospital A reshapes its inventory system, emphasizing customization and procedural flexibility over efficiency and standardization. Whilst these practices align with surgeons' focus on patient outcomes, they create challenges in achieving optimal IM, requiring a delicate balance between meeting clinical needs and ensuring operational sustainability. Addressing these challenges would necessitate a more substantial institutional commitment to standardization and collaborative efforts to align surgeons' interests with broader organisational goals.

5.2 Case B (Low hospital-based physicians and public-funded)

5.2.1 The power of surgeons in the Inventory System

In Hospital B, surgeons' influence within the IM system is relatively low to moderate. This is primarily due to the structured controls inherent in the Colombian NHS, which mandates patient flow management and inventory practices. The healthcare system directs patients to hospitals based on cost, clinical outcomes, and network affiliations, limiting surgeons' ability to attract patients directly, as is common in privately funded settings. Consequently, Hospital B maintains a standardized approach to inventory management, where public funding constraints and procedural oversight restrain flexibility in accommodating specific physician requests.

Hospital B enforces strict policies for PPI requests, requiring formal justifications and budget alignment with Colombian NHS guidelines. This aligns with feedback from C-level executives, who have highlighted that new medical devices or costly items are only approved if they align with NHS funding criteria. As one C-level interviewee noted, "If the NHS doesn't pay for it, we won't buy it; this keeps us focused on budget constraints". This statement underscores the hospital's priority on budgetary adherence over surgeon-driven procurement decisions.

Interviews with logisticians reveal a persistent tension in balancing surgeon preferences with standardized inventory protocols. Some surgeons, frustrated with standardization, attempt to assert their preferences by pressuring logistics staff or bypassing standard procedures when possible. Despite these pressures, hospital protocols and logistical controls ultimately constrain surgeons' influence. At Hospital B, logisticians are crucial in balancing these demands, navigating between strict protocols and occasional surgeon requests for specific items. For instance, observations indicate that surgeons sometimes request items not included in the standard trays prepared by logistics. However, any deviations are carefully monitored to ensure compliance with budget constraints and procedural guidelines. As one logistician explains, "Surgeons expect us to have everything, but public funding means some requests are beyond our capability." This

illustrates that whilst there is flexibility to meet critical needs, broad customization or inventory expansion remains limited.

However, surgeons occasionally influence specific, high-priority cases, especially concerning critical surgeries. Nonetheless, these decisions must align with the institution's priorities and budget limitations. C-level support for inventory standardization further reinforces the hospital's moderate flexibility. Additionally, document analysis from Hospital B reveals that inventory turnover rates, whilst lower than the other three hospitals, are improving steadily. The observed turnover rate of 10 per year and an inventory accuracy rate of 92% are expected to improve as Hospital B's recent automation project stabilizes, enabling more effective resource management and cost containment.

The non-hospital-based physician model is a significant influencing factor in this dynamic. This contractual arrangement affects surgeons' sense of ownership and alignment with hospital priorities, as they may not identify as closely with Hospital B's goals or protocols. This lack of alignment often results in surgeons acting as demanding stakeholders who, whilst influential in specific cases, have limited overall power in shaping IM practices due to their external position. As one logistician remarked, "In the time in which the organisational leaders, especially the medical leaders, have the same clarity (alignment) and we all comply with policies and procedures, we are going to be different, but we are far from there." This statement highlights the inherent challenges in achieving unified objectives between administrative and medical leaders, a gap intensified by the non-hospital-based model.

Whilst surgeons at Hospital B have some input in IM practices, particularly in critical surgical cases, their influence is constrained by a publicly funded model prioritizes standardization, cost control, and compliance with Colombian NHS guidelines. The low to moderate power observed in Hospital B highlights a system where surgeon influence is balanced by institutional policies, creating a structured IM environment with limited flexibility compared to privately funded counterparts. This dynamic is captured in Table 5-3, which reflects the moderated influence surgeons hold within Hospital B's IM practices.

Table 5-3 Power of Surgeons in Hospital B

Theme	Data Source	Data	Conclusion
Power of Surgeons in the IM System (Code E)	Interviews with C-levels	<i>"Every time he (a surgeon) proposes a new medical device, he must fill up a technical format stating that he has no conflict of interest. What happens is that here, the corporate ethical procedures are still weak, and in the end, the hospital could buy it".</i>	Hospital B is new, and some aspects of its culture are still being built. They have a code of ethics, but the C-level thinks that it is weak and, in the end, has not diminished the power of surgeons and their relationship with the industry.
		<i>"Our medical units' chiefs are accountable for the medical outcome and the patient's safety, as well as the quality of service, patient care, efficiency, and costs".</i>	C-level accountability for multiple metrics limits surgeons' control, focusing on efficiency and cost-effectiveness
		<i>"A few days ago, someone (a surgeon) asked me if we would invest in new medical technology, and my response was that if and only if the NHS will pay for it" – C-level.</i>	Since Hospital B is public-funded, cost containment is a priority over surgeons' technology demands.
	Interviews with Logisticians	<i>"Surgeons expect us to have everything, but public funding means some requests are simply beyond our capability."</i>	Surgeons often exceed logistical capacity, further constrained by funding model limitations.
		<i>"In the time in which the organisational leaders, especially the medical leaders, have the same clarity (alignment) and we all comply with policies and procedures, we are going to be different, but we are far from there".</i>	This statement highlights a gap in alignment between medical and administrative leaders, influenced by the non-hospital-based contracts for surgeons. Although there is a vision of unifying goals, complete alignment in IM practices is yet to be achieved.
		<i>"Every time they (surgeons) complain, because again we prepare a standardised tray with certain products, but they don't accept them and want their special items".</i>	Standard practices are often met with resistance from surgeons, yet logisticians maintain control over tray configurations.
	Interviews with Surgeon	<i>"In the medical exercise, administrative decisions should never be above medical decisions."</i>	This reflects surgeons' frustrations with standardization initiatives. Surgeons view administrative constraints as potentially compromising patient care.
		<i>"I am risking the patient's relationship with the narrow portfolio of products of this institution" – Surgeon.</i>	Surgeons feel limited by standardized inventory, indicating moderate influence over inventory decisions.
		<i>"In surgery, you need to have a very versatile process. Decisions are made rapidly, and rigid procedures can lead to errors in inventory availability.</i>	Surgeons require flexibility in the operating room, but their influence over inventory is limited.

Theme	Data Source	Data	Conclusion
Power of Surgeons in the IM System (Code E)	Observations	Observations indicated recurrent tensions between surgeons and logistics staff over item availability, with surgeons expressing frustration about the standardization process.	Structured procurement policies curtail Standaits surgeons' customization options and power.
		During surgeries, logisticians maintain inventory levels per standardized procedures, occasionally managing exceptions when absolutely necessary, creating moderate flexibility within strict limits.	Observations confirm that flexibility is limited, as established protocols constrain it.
		Observations show recurring tension between surgeons' demands and logistics staff compliance with the Pharmacy Committee's standardization mandate.	Conflicting priorities between surgeons and logistics reveal a structured, compliance-focused system.
	Document Analysis	Pharmacy Committee documents highlight strict procedures for adding new PPIs, showing how cost control guidelines limit surgeon-driven procurement decisions.	Hospital B's reliance on standardized protocols reduces surgeons' ability to influence inventory decisions.
		Inventory reports show that, despite surgeon requests, high-cost items are closely monitored and restricted due to NHS funding limitations. Public funding oversight limits surgeons' control over inventory expansion.	Hospital B's reliance on structured protocols restricts the ability of surgeons to influence inventory adjustments, highlighting a standardized approach to inventory management.
		Whilst lower than some benchmarks, the annual turnover rate of 10 and inventory accuracy of 92% reflect a structured IM approach appropriate for a new hospital. These metrics are expected to improve as demand stabilizes.	Hospital B is a relatively new hospital, with its automation project in the early stages and undergoing stabilization. On a positive note, the hospital is actively investing in automation as part of a strategy focused on cost containment and operational efficiency.

Source: The author

5.2.2 The interests of surgeons in the Inventory System

The interests of surgeons in Hospital B's inventory management IM system are diverse and reflect their commitment to patient care, clinical precision, and collaboration with stakeholders. As shown in Table 5-4, these interests, explored as the categories of patient representation, product experience, relationships with manufacturers, and cost considerations, influence IM practices significantly. These interests, whilst patient-focused, introduce operational challenges in balancing clinical demands and logistical constraints.

A strong emphasis on patient-focused care is evident in the hospital's approach to standardizing surgical trays. A C-level explained, *"We have created 76 different trays of regular surgical procedures that go from appendicitis to bariatric surgery, and what this is going to allow us is to optimize resources and reuse some of the medical devices in the tray if the manufacturer allows us."* This initiative demonstrates how surgeons' preferences align with ensuring procedural efficiency and resource optimization, even within the constraints of a cost-driven public healthcare model. However, variability in surgical practices poses challenges to these standardization efforts. As another C-level noted, *"We say to surgeons to use the tray A, B, or C, but they respond that they can't know with certainty which trays to use until they are in the OT with the patient, and this is partially true"*. This variability highlights surgeons' focus on patient-specific needs but complicates institutional efforts to reduce waste and improve predictability.

Experience with specific products also plays a key role in surgeons' interests. Surgeons value equipment tailored to their procedures, emphasizing precision and reliability. The surgeon stated, *"Our work is based on precision; tools and devices matter immensely"*, underscoring the importance of familiar tools for achieving optimal outcomes. Similarly, surgeons' relationships with suppliers reflect their reliance on consistent product quality, as highlighted by another surgeon: *"We rely on our trusted suppliers to provide consistent quality"*. These

preferences contribute to procedural success but increase logistical complexity and cost.

Moreover, relationships with manufacturing representatives further influence surgeons' interests in IM. Sales representatives were observed engaging directly with surgeons to recommend high-cost PPIs, though logisticians mediate access. This controlled access ensures alignment with hospital policies whilst accommodating surgeons' demand for advanced tools. A C-level acknowledged the necessity of managing these interactions: *"We should cope with this reality (relationship with manufacturing representatives) of the surgeons and control this variability without damaging the medical autonomy principle"*. This tension reflects the hospital's efforts to balance clinical autonomy with operational efficiency and transparency.

On the other hand, cost considerations are a dominant factor in shaping the IM system at Hospital B due to its reliance on public funding. A C-level stated, *"A few days ago, someone asked me if we would invest in new medical technology, and my response was that if and only if the NHS will pay for it"*. This underscores the tight financial constraints imposed by the public healthcare model, where every decision must align with budgetary priorities. The reliance on vendor-managed inventory (VMI) for surgeon-requested PPIs further reflects this cost orientation, as it allows the hospital to manage inventory availability whilst reducing internal financial risks.

Moreover, surgeons' demands for specialized tools and devices, which often come at a high cost, must be carefully balanced against these financial realities. Logisticians noted that *"surgeons often request last-minute adjustments to inventory to cater to specialized surgeries"*, emphasizing how such demands strain the hospital's ability to maintain cost discipline whilst meeting clinical needs. This dynamic illustrates the constant tension between surgeons' procedural priorities and the hospital's efforts to ensure financial sustainability within the constraints of public healthcare funding.

Table 5-4 Interests of surgeons in Hospital B

Theme	Data Source	Data	Conclusion
Interest of Surgeons (Code J)	Interviews with C-levels	<i>"We have created 76 different trays of regular surgical procedures that go from appendicitis to bariatric surgery, and I am talking from a low complexity surgery to a high complexity, and what this is going to allow us is to optimize resources and reuse some of the medical devices in the tray if the manufacturer allows us"</i> – C-level.	The hospital's primary resource, the patients, is part of Public HC system affiliated companies. These companies decide where to send a patient according to a Public network. The Public HC system pays for healthcare services with cap prices. As expressed during the interviews, the previous creates pressure on cost and efficiency.
		<i>"A few days ago, someone asked me if we would invest in new medical technology, and my response was that if and only if the NHS will pay for it"</i> – C-level.	
		<i>"We say to surgeons to use the tray A, B or C, but they respond that they can't know with certainty which trays to use until they are in the OT with the patient, and this is partially true".</i>	The standardization process is complex due to the variability of surgery. In the expression "partially true", the author inferred that part of the variability could be reduced with better inventory practices and that the C-level knows it.
		<i>"Today, we should have bar codes for tracing and doing better logistics, so in response, we do it in the hospital with a huge cost. We make a lot of effort, not the industry, and the reason probably is that they are afraid of price control, and I don't see further intentions for this commitment".</i>	Hospital B wants to lead the relationship with manufacturing representatives; they believe better IM practices are possible if the medical devices and pharmaceutical industry work jointly with the hospital. C-level sees inventory's traceability and the vendors' role.
		<i>"We should cope with this reality (relationship with manufacturing representatives) of the surgeons and control this variability without damaging the medical autonomy principle because the industry (pharmaceutical and medical devices industry) will always be there, and you can't go against it, they are part of the commercial relationship, but we need to guarantee transparency".</i>	Hospital B has worked on the compliance code for healthcare professionals and seeks to declare possible breaches through a pharmacy committee. They understand that the manufacturing representatives are key stakeholders and must be aligned with a code of conduct.
	Interviews with Logisticians	<i>"A significant issue is the clinical knowledge of logisticians. In my case, I am a nurse, so that I can talk with surgeons differently than other logisticians without that background, and therefore, it is different to make them change their opinions and preferences".</i>	Hospital B has chosen to orchestrate the PPIs with logisticians from healthcare backgrounds. The patient's interests are kept on the agenda, and sometimes surgeons change their opinions and embrace the inventory system.
Interest of Surgeons (Code J)	Interviews with Logisticians	<i>"Surgical groups often work collaboratively with logistics to refine inventory setups based on practical experience".</i>	Experience with specific products fosters surgeon-logistician collaboration, ensuring inventory meets procedural and clinical requirements.

Theme	Data Source	Data	Conclusion
		<i>"We have to ensure devices are available, or patient care suffers".</i>	Emphasis on maintaining availability reflects surgeons' interest in prioritizing patient-focused inventory practices.
		<i>"Surgeons often request last-minute adjustments to inventory to cater to specialized surgeries".</i>	Surgeons' flexibility and customization interests can disrupt logistical operations, impacting planning and standardization efforts.
	Interviews with Surgeon	<i>"In the medical exercise, administrative decisions should never be above medical decisions" – Surgeon.</i>	In this interview, the surgeon commented on administrative decisions in the inventory system. It seems that standardization and inventory initiatives were in the implementation phase.
		<i>"Surgeons need the right tools, at the right time, to guarantee the best possible outcomes".</i>	The surgeons' interest lies in ensuring procedural success, driving demand for precise and timely inventory availability.
		<i>"Our work is based on precision; tools and devices matter immensely".</i>	Surgeons value equipment tailored to their procedures, focusing on experience with specific PPIs.
		<i>"We rely on our trusted suppliers to provide consistent quality".</i>	Surgeons' relationships with suppliers influence their preference for consistent quality in inventory.
	Observations	Surgical trays were tailored to each speciality, with variability between surgical departments and logisticians leading the standardization process, and the CMO was also involved.	The standardization initiatives are important for the institution, and logisticians have led the initiative.
		Inventory discrepancies often occur after specialized surgeries due to manual adjustments influenced by surgeons, and tension was observed. C-level fully supported logisticians' initiatives.	Surgeons' last-minute demands challenge the accuracy and consistency of inventory records. Surgeons' changes in standardized procedures create tensions, acting as demanding stakeholders.
		Sales representatives were observed engaging directly with surgeons to recommend high-cost PPIs, but they first needed to go through the logistics department.	Logisticians maintain the controlled access whilst balancing surgeons' preferences.
	Document Analysis	Reports emphasize the reliance on VMI for surgeon-requested PPIs, reducing internal control.	Surgeons' reliance on preferred vendors emphasizes clinical trust but complicates institutional control over inventory.

Source: The author

5.2.3 Influencing the Inventory System in Hospital B

Institutional constraints and their clinical priorities shape surgeons' influence on Hospital B's IM system. Hospital B operates under the Colombian NHS, which imposes stringent cost controls and standardization requirements. The hospital's low proportion of hospital-based physicians further compounds these dynamics, creating tension between surgeons' clinical autonomy and institutional priorities.

The power of surgeons in Hospital B is characterized as **low to moderate**, limited primarily by the NHS's cost-driven public funding framework. This structure reduces surgeons' unilateral decision-making power, particularly concerning high-cost PPIs. A C-level explained, *"If the NHS doesn't pay for it, we won't buy it,"* underscoring how funding constraints guide procurement decisions. However, surgeons retain some influence in high-stakes clinical scenarios, as logisticians highlighted: *"Surgeons often request last-minute adjustments to inventory to cater to specialized surgeries"*. These unplanned demands disrupt operational efficiency and complicate standardization efforts, illustrating the tension between surgeons' procedural needs and institutional cost control.

The hospital's organisational structure, with a low proportion of hospital-based physicians, further exacerbates this tension. Many surgeons operate independently, leading to procedural preferences and inventory demands variability. A logistician remarked, *"We have to ensure devices are available, or patient care suffers,"* reflecting the challenges of managing a diverse set of surgeon preferences whilst maintaining operational consistency. This independence contrasts with hospitals that employ more hospital-based physicians, where alignment with institutional protocols tends to be stronger.

Surgeons' interests in the IM system also highlight their influence. Their focus on ensuring patient-specific care is evident in their emphasis on tailored tools and equipment. One surgeon emphasized, *"Surgeons need the right tools, at the right time, to guarantee the best possible outcomes"*. Whilst this aligns with their role as advocates for procedural success, it often clashes with the hospital's focus on

cost containment and efficiency. Furthermore, the variability in their procedural needs, as noted by a C-level—*“We say to surgeons to use the tray A, B, or C, but they respond that they can't know with certainty which trays to use until they are in the OT with the patient”*—adds complexity to standardization initiatives.

Relationships with manufacturing representatives further reflect surgeons' influence. Whilst surgeons retain autonomy in selecting tools, their access to high-cost PPIs is dictated by institutional protocols. Sales representatives engage surgeons directly but must first navigate the logistics department's controls, ensuring alignment with hospital policies. A C-level noted, *“We should cope with this reality (relationship with manufacturing representatives) of the surgeons and control this variability without damaging the medical autonomy principle”*. This controlled interaction emphasizes the hospital's efforts to balance clinical autonomy with transparency and institutional accountability.

The NHS's emphasis on cost containment and the reliance on vendor-managed VMI agreements also temper surgeons' influence. Whilst VMI ensures the availability of critical items, it reduces surgeons' ability to shape inventory beyond immediate clinical needs. This dynamic underscores the tension between institutional cost priorities and surgeons' procedural demands.

In conclusion, the influence of surgeons' power and interests in Hospital B's IM system is shaped by a publicly funded model, limited hospital-based physician alignment, and procedural variability. Whilst surgeons advocate for patient-centric care and procedural success, institutional policies systematically regulate their influence. The interplay between their clinical priorities and organisational constraints reflects a nuanced balance emphasising the need for strategies aligning clinical and operational goals.

5.3 Case C (High hospital-based physicians and Private-funded)

5.3.1 The power of surgeons in the Inventory System

Surgeons at Hospital C hold a notably **high** power that sways IM practices, shaped by the hospital's private funding orientation and a high proportion of hospital-based physicians. As shown in Table 5-5, this dynamic is reinforced by institutional frameworks prioritising clinical outcomes, granting surgeons substantial authority in shaping operational and strategic decisions.

Surgeons' power is evident in their control over high PPIs. For example, a C-level executive noted, *"If the clinical executive committee decides that technology is important for a certain type of cancer, they don't ask: how much does it cost? How is it going to be paid? Why is it so expensive?"*. This highlights how medical priorities often supersede financial or operational considerations.

Hospital C's structure emphasizes the central role of physicians in governance. The Chief Medical Officer (CMO) reports directly to the board of directors, not the CEO. This arrangement ensures that medical decision-making, including inventory choices, is guided by clinical priorities rather than administrative pressures. One respondent stated, *"The executive medical committee reports to the board of directors about medical issues and not to the hospital's CEO,"* showing surgeons' autonomy within the institution.

Despite significant standardization efforts, surgeons maintain the flexibility to modify inventory setups for specific procedures. A logistician observed, *"Surgical trays are standardized, but surgeons often need custom additions for specific cases"*. This operational compromise ensures procedural precision but increases complexity in IM systems.

Logisticians at Hospital C face challenges balancing surgeon-driven customization with operational efficiency. For instance, they reported bypassing standard protocols to meet surgeons' demands: *"Because it makes the scrub nurse avoid problems with surgeons, [the team] provides more inventory"*. Such deviations, whilst aimed at maintaining clinical harmony, highlight the strain surgeons' influence places on IM practices.

Despite these challenges, Hospital C has achieved commendable performance in IM-related KPIs. Inventory turnover is maintained at 23 days, and accuracy remains below a 1% discrepancy. These metrics reflect the hospital's ability to align surgeon preferences with institutional efficiency. This success is attributed to integrating clinical guidelines into inventory processes, as highlighted in Table 5-5. The stewardship mindset of hospital-based physicians further supports alignment between clinical and operational goals.

However, the hospital's emphasis on clinical investments has delayed the adoption of advanced inventory systems. Logisticians rely heavily on manual processes, controlled via Excel, to manage inventory. A logistician remarked, *"Inventory management relies on Excel, which requires significant manual effort to maintain accuracy"*. This reliance hinders scalability and underscores the need for automation.

In conclusion, the power of surgeons in Hospital C is deeply embedded within its institutional structure and culture. Whilst this influence ensures alignment with clinical priorities, it introduces operational inefficiencies that challenge standardization and scalability. Table 5-5 illustrates the balance Hospital C achieves through solid governance and clinical stewardship, providing a framework for navigating the complexities of surgeon-driven IM practices. Investments in advanced systems could further enhance efficiency without undermining surgeons' pivotal role in decision-making.

Table 5-5 Power of Surgeons in Hospital C

Theme	Data Source	Data	Conclusion
Power of Surgeons in the IM System (Code E)	Interviews with C-levels	<i>"And the regulator hasn't even realized of the new publication (medical device new application); we are responsible for delivering it to the patient".</i>	Highlights the significant influence of surgeons in driving procurement, emphasizing clinical importance whilst adhering to institutional protocols.
		<i>"They (logistics staff) tell me to buy cheaper products or generic brands. And the question here is, if you want stable clinical results, then you should have quality products, and they tell me that it makes it difficult in terms of profitability, to which I respond how many patients do you want me to kill?"</i>	Prioritizing quality reflects a strategic focus on patient outcomes, reinforcing surgeons' leverage in inventory decisions.
		<i>"The executive medical committee reports to the board of directors about medical issues, not the hospital's CEO. It is possible to have a chief medical officer with the same power as the general director, relevant to the organisation and independence".</i>	The structure emphasizes surgeon autonomy and indirect influence on inventory decisions, bypassing direct operational leadership.
	Interviews with Logisticians	<i>"Because it makes the scrub nurse avoid problems with surgeons, provides more inventory".</i>	Hospital C has worked hard to implement standardization in all medical and operational processes. However, in the case of PPIs or customized trays, nurses do not fully comply with the standard protocol and deliver more inventory.
		<i>"Inventory management prioritizes safety, quality, and efficiency in pharmaceuticals and medical devices".</i>	The strategic focus on safety and quality aligns logisticians' efforts with clinical outcomes, reinforcing their critical role in maintaining high standards.
		<i>"Inventory management relies on Excel, which requires significant manual effort to maintain accuracy".</i>	Logisticians' push for ERP implementation reflects their proactive role in addressing inefficiencies, particularly to meet surgeons' high customization demands. However, clinical priorities still dominate decision-making, delaying investments in automation.
	Interviews with Surgeon	<i>"Surgical trays are standardized, but surgeons often need custom additions for specific cases".</i>	Surgeons exercise high power in customizing surgical trays, challenging standardization but ensuring procedural precision and safety.

Theme	Data Source	Data	Conclusion
Power of Surgeons in the IM System (Code E)	Interviews with Surgeon	<i>"The centralization of procurement allows for efficiency, but surgeons feel constrained by reduced decision-making power".</i>	The centralized system balances efficiency with surgeon preferences, but surgeons' influence remains high, particularly in advocating for clinical priorities.
		<i>"Surgeons can request new instruments, but these must go through the medical committee approval process.".</i>	The committee approval process integrates surgeons' preferences into decision-making whilst maintaining institutional control over inventory costs and quality.
	Observations	Surgeons frequently customize trays during procedures to meet specific patient needs; this customization operates within a framework of standardization based on clinical guidelines.	Surgeons' procedural control drives high variability in IM practices, reinforcing their influence on logistics and customization efforts.
		Manual inventory checks, controlled primarily through Excel, require significant personnel effort.	Despite the institution's substantial investment in clinical best practices, there is a noticeable lack of investment in modern inventory management systems aligned with operational best practices, highlighting an area for potential improvement.
		Collaboration between surgeons and logisticians reduces tension during inventory-related challenges during surgery.	Strong alignment between hospital-based surgeons and logisticians mitigates tensions, fostering a cooperative approach to balancing clinical and operational needs.
	Document analysis	The inventory turnover at Hospital C stands at 23 days, whilst inventory accuracy is 99%.	Interestingly, despite the high influence of surgeons on inventory practices, the KPIs remain strong. This performance is attributed to two key factors: the standardization processes guided by clinical guidelines, ensuring consistency, and the stewardship spirit fostered by hospital-based physicians, reinforcing alignment between clinical and operational priorities.
		Standardization with clinical guidelines documented in the medical domain ensures alignment with evidence-based practices.	Using clinical guidelines in inventory management provides a structured framework, balancing the need for customization with operational efficiency.

Source: The author

5.3.2 The interests of surgeons in the Inventory System

Hospital C competently aligns with patient interests, prioritising clinical outcomes through rigorous operational standards and advanced medical technology. The hospital consistently invests in state-of-the-art equipment and maintains high procedural standards through detailed protocols and KPIs. A C-level explained, *“I think we work in continuous improvement and the best clinical outcomes for the patients, and we can measure it”*. This reflects the hospital's philosophy of driving enhancements in patient care and procedural efficiency through measurable outcomes, supported by its organisational structure with a high proportion of hospital-based physicians. This model fosters close collaboration between clinicians and the institution, promoting a shared commitment to clinical excellence.

The hospital narrows the product portfolio but allows surgeons to decide which items to use based on their experience with preferred products. Surgeons view tools and devices as integral to their skills, emphasising the importance of personalised options. As one surgeon stated, *“In surgery, tools and devices are an extension of our skills; preferences matter”*. This underscores their interest in aligning procedural tools with their expertise to achieve optimal outcomes. However, logisticians reported operational challenges, stating, *“We depend on the surgeon’s likes; some of them use brand A, others from brand B”*. This variability in preferences adds complexity to logistical processes, necessitating manual interventions to maintain availability and efficiency. Nonetheless, the high proportion of hospital-based physicians mitigates some of these challenges, fostering greater alignment with institutional protocols and goals.

The relationship with manufacturing representatives is another essential component of Hospital C's inventory system. Sales representatives engage first with logisticians before presenting high-cost PPIs to surgeons. This structured process reflects the hospital's private-funded model, attracting prestigious surgeons whilst respecting their clinical autonomy. A C-level emphasised the

importance of transparency in these interactions, stating, *“Our medical staff share the philosophy that their incomes should come from the medical practice and not from the industry”*. This ethical approach fosters trust and aligns with the hospital’s philosophy of maintaining transparency whilst prioritising patient care.

Surgeons’ interests in Hospital C also extend to ensuring immediate access to critical PPIs, particularly during emergencies. One surgeon noted, *“During emergencies, having specific devices readily available is non-negotiable”*. This priority aligns with the hospital’s commitment to high inventory accuracy and availability. Document analysis revealed that the hospital achieves 99% inventory accuracy with a 23-day turnover rate, reflecting its ability to balance surgeons’ demands with logistical efficiency. A high proportion of hospital-based physicians further supports this balance by ensuring that clinical and operational priorities align more closely.

Cost considerations remain a significant factor in shaping the IM system at Hospital C. Whilst the hospital avoids cost-cutting measures that compromise surgical quality, it remains committed to achieving value through efficiency. A C-level remarked, *“It is important to understand this and not fall into the temptation of reducing costs in the case of surgery with the replacement of cheaper medical devices or pharmaceuticals or the reduction of the surgical kit without sufficient medical evidence”*. This illustrates how the hospital’s private-funded model supports a careful balance between quality and surgeon's talent attraction, reflecting surgeons’ interests in maintaining high standards of care.

In conclusion, surgeons’ interests in Hospital C focus on achieving optimal patient outcomes, maintaining trusted supplier relationships, and ensuring procedural flexibility. The hospital’s private funding and high proportion of hospital-based physicians enable a collaborative approach to aligning clinical and operational priorities. However, these dynamics introduce logistical challenges, requiring careful management to sustain clinical excellence and organisational efficiency. Table 5-6 provides detailed evidence supporting these dynamics, illustrating how surgeons’ interests influence and interact with Hospital C’s IM practices.

Table 5-6 The interests of surgeons in Hospital C

Theme	Data Source	Data	Conclusion
Interest of Surgeons (Code J)	Interviews with C-levels	<i>"I think that we work in continuous improvement and the best clinical outcomes for the patients and we can measure it".</i>	Hospital C has been working on continuous improvement initiatives with the patient's health as the higher purpose. They have thousands of protocols and KPIs for clinical and administrative tasks and processes.
		<i>"The hospital's magic is our operations standards, and we have myriad standards in which all the processes are described, and they have KPIs so we can see how we are working compared to a standard. I have to say that it is very challenging under an enormous effort of the people and operationally".</i>	Hospital C's operational standards and KPIs ensure consistency and quality, but their complexity demands significant effort, reflecting surgeons' interest in aligning clinical practices with measurable outcomes.
		<i>"Our greatest challenge is to add more value (clinical outcomes) with less cost".</i>	Hospital C works to add value and not just to reduce costs. During the interviews, the C-level explained how Hospital C adds value and charges.
		<i>"It is important to understand this and not fall into the temptation of reducing costs in the case of surgery with the replacement of cheaper medical devices or pharmaceuticals or the reduction of the surgical kit without sufficient medical evidence".</i>	Hospital C prioritizes maintaining surgical quality by avoiding cost-cutting measures like substituting cheaper devices or reducing kits without solid medical evidence, aligning with surgeons' interest in ensuring optimal patient outcomes.
		<i>"If it (medical device) is clinically significant, then the medical committee acquires the responsibility to get it".</i>	Hospital C works in surgical groups with the intention of standardizing. The brand's adoption is a whole unit's decision and not a single surgeon's desire.
		<i>"Our medical staff share the philosophy that their incomes should come from the medical practice and not from the industry".</i>	Hospital C complies with the code of ethics for medical staff. The high number of hospital-based physicians helps to increase compliance.
	Interviews with Logisticians	<i>"We depend on the surgeon's likes some of them use of brand A, others from brand B".</i>	Hospital C's inventory system reflects surgeons' preferences, as logisticians adapt to varied demands for specific brands, highlighting the influence of surgeons' individual choices on operational practices.
		<i>"In high-demand surgeries, the lack of automated inventory systems means we have to track inventory manually to ensure availability for surgeons".</i>	Logisticians face operational challenges due to surgeons' demands and the absence of robust inventory systems, affecting efficiency.

Theme	Data Source	Data	Conclusion
Interest of Surgeons (Code J)	Interviews with Logisticians	<i>"A significant issue is the lack of a systematic process; we rely heavily on human oversight for inventory management".</i>	Surgeons' demand for inventory flexibility adds complexity to logistical processes, requiring manual interventions to meet their needs.
	Interviews with Surgeon	<i>"Maintaining inventory for varied surgical procedures creates logistical challenges but aligns with patient-focused care".</i>	Surgeons' procedural variability is met with logistical adjustments, ensuring alignment with patient-centred outcomes.
		<i>"In surgery, tools and devices are an extension of our skills; preferences matter".</i>	Surgeons' interest in personalized tools reflects their commitment to achieving optimal procedural outcomes.
		<i>"During emergencies, having specific tools readily available is non-negotiable".</i>	Surgeons' interest lies in ensuring immediate access to critical tools for patient safety and procedural success.
		<i>"The availability of trusted suppliers helps us maintain consistency in outcomes".</i>	Surgeons emphasize the importance of relationships with reliable manufacturers to support consistent procedural success.
	Observations	Sales representatives were observed engaging with logisticians before presenting high-cost PPIs to surgeons.	The structured engagement process reflects institutional efforts to manage costs whilst accommodating surgeons' clinical needs.
		Variability in surgical trays was observed, with surgeons requesting specific adjustments depending on their preferences.	The lack of standardization in surgical trays reflects surgeons' focus on personalized care and experience with specific tools.
	Document Analysis	Reports show a reliance on VMI agreements for specialized devices requested by surgeons.	VMI agreements emphasize the hospital's approach to balancing cost efficiency with meeting surgeons' clinical needs.
		Documented clinical guidelines have streamlined procurement but require surgeons to adjust preferences to align with institutional goals.	Clinical guidelines aim to harmonize surgeons' preferences with operational objectives, fostering alignment with broader institutional priorities.
		KPI documents of 23 days of inventory turnover with 99% inventory accuracy and with efforts to align availability with surgeons' demands whilst maintaining efficiency.	The hospital's inventory KPIs reflect an effort to balance logistical efficiency with surgeons' procedural variability.

Source: The author

5.3.3 Influencing the Inventory System in Hospital C

The influence of surgeons on the inventory management (IM) system at Hospital C is shaped by their significant power within a context of private funding and a high proportion of hospital-based physicians. This unique organisational structure enhances collaboration and alignment with clinical goals whilst simultaneously introducing operational efficiency and resource allocation complexities.

Surgeons' power in Hospital C stems from their central clinical and organisational governance role. The Chief Medical Officer (CMO) directly reports to the board, bypassing the CEO, which ensures clinical decisions are prioritised. A C-level noted, *"The executive medical committee reports to the board of directors about medical issues, not the hospital's CEO."* This structure elevates surgeons' authority, enabling them to shape inventory policies, particularly for high-value physician preference items (PPIs). For example, the medical committee's decisions often supersede cost considerations, as reflected in the comment, *"If it (a medical device) is clinically significant, then the medical committee acquires the responsibility to get it."* This underscores the hospital's focus on clinical outcomes whilst maintaining surgeon autonomy.

Hospital C's private funding further amplifies surgeons' influence, as surgeon reputation and preference often determine patient flow. Surgeons attract patients due to the hospital's clinical excellence and their standing, granting them substantial leverage in inventory-related decisions. Whilst this power allows for greater flexibility in customising surgical trays and acquiring specific products, it also challenges standardisation efforts. A logistician remarked, *"Surgical trays are standardised, but surgeons often need custom additions for specific cases."* Whilst ensuring procedural precision, this operational flexibility increases logistical complexity and labour-intensive practices.

The interests of surgeons at Hospital C align closely with achieving clinical excellence. They focus on optimising patient outcomes through advanced medical devices and adherence to clinical guidelines. Surgeons collaborate with the hospital in narrowing the product portfolio, ensuring decisions are based on robust evidence. However, they expect immediate availability of critical tools, especially during emergencies. As one surgeon stated, *“During emergencies, having specific devices readily available is non-negotiable.”* This demand, coupled with the hospital’s commitment to clinical standards, has led to a high inventory accuracy rate of 99% and a turnover of 23 days, as documented in operational KPIs.

Relationships with manufacturing representatives also play a key role in shaping the IM system. Whilst sales representatives engage with surgeons to recommend high-cost PPIs, access is regulated by logisticians to ensure alignment with institutional policies. This structured interaction reflects the hospital’s effort to balance clinical autonomy with cost management. A C-level noted, *“Our medical staff share the philosophy that their incomes should come from the medical practice and not from the industry,”* reinforcing a culture of transparency and ethical engagement.

Despite their influence, surgeons in Hospital C act cooperatively, aligning with institutional goals such as standardisation and process efficiency. The high proportion of hospital-based physicians fosters a stewardship mindset, promoting collaboration between clinical and operational teams. Investments prioritise medical technology and clinical advancements, whilst logistical automation remains underfunded. Logisticians highlighted the challenges of manual inventory processes, stating, *“Inventory management relies on Excel, which requires significant manual effort to maintain accuracy.”* This reflects the hospital’s focus on clinical excellence at the expense of operational scalability.

In conclusion, surgeons at Hospital C wield significant influence over the IM system, driven by their clinical priorities and organisational power. This influence is tempered by a cooperative culture and a commitment to institutional goals,

allowing the hospital to balance operational complexities with its pursuit of clinical excellence.

5.4 Case D (High hospital-based physicians and Public-funded)

5.4.1 The power of surgeons in the Inventory System

The power of surgeons in Hospital D is low, shaped significantly by its public funding model and the high proportion of hospital-based physicians. The Colombian NHS regulates patient flow, assigning hospitals based on healthcare networks, costs, and clinical outcomes. This external control reduces the influence of individual surgeons, as decisions about patient allocation and procedural funding are determined outside the hospital.

Hospital D operates within a structured framework that prioritizes standardization and adherence to clinical guidelines. Surgeons contribute to resource decisions through collaborative committees, such as the Pharmacy and Procurement Committees, which evaluate clinical necessity and financial sustainability. As noted in interviews, “Here is not the surgeon’s like but rather what the clinical guidelines say,” emphasizing the institution’s focus on evidence-based practices over personal preferences. This system ensures that new inventory requests undergo rigorous technical and budgetary reviews, balancing clinical needs with institutional goals.

The high proportion of hospital-based physicians fosters a stewardship spirit that aligns with clinical and operational objectives. Unlike hospitals where surgeons exert substantial control, in Hospital D, their influence is aligned with institutional priorities. This collaborative dynamic allows surgeons to contribute strategically whilst adhering to standardized protocols, reducing variability and enhancing efficiency. The long-standing focus on standardization has been reinforced by departmental leadership, which has driven alignment with medical guidelines and institutional efficiency.

IM practices in Hospital D reflect its commitment to efficiency and clinical excellence. Semi-automated systems, such as real-time tracking and automated dispensing machines, ensure the high availability of critical items whilst minimizing manual intervention. These systems, combined with standardized

procedures, reduce errors and prevent stockouts. Whilst occasional surgeon requests for specific items are addressed collaboratively, these are exceptions rather than the norm, as the overarching framework prioritizes institutional consistency.

The hospital's financial oversight further moderates the influence of surgeons in inventory decisions. Public funding necessitates strict budget adherence, limiting surgeons' ability to bypass standard procurement processes. Observations highlight that logistics staff and C-level executives exercise greater control over inventory systems, ensuring alignment with operational goals. This dynamic contrasts with private hospitals, where surgeon influence often dominates, creating variability in inventory practices.

The low power of surgeons in Hospital D is evident when compared to other institutions, such as Hospitals A, B, and C. Surgeons here adapt to standardized protocols and contribute to decision-making within the boundaries of institutional priorities. The collaborative approach ensures that clinical and logistical teams work together to address inventory needs without compromising efficiency or compliance. Hospital D's integration with a top regional university further enhances its commitment to research and best practices, strengthening its focus on operational sustainability and clinical outcomes.

Hospital D exemplifies a well-balanced system where surgeon influence is incorporated without undermining standardization or operational goals. The structured decision-making framework, high reliance on clinical guidelines, and stewardship of hospital-based physicians create a cohesive environment that prioritizes efficiency, cost management, and patient care. This model ensures alignment across clinical and operational domains whilst maintaining flexibility for critical medical decisions. Table 5-7 highlights Hospital D's structured decision-making, where surgeons' influence is balanced by institutional priorities, emphasizing standardization, clinical guidelines, and efficient operations.

Table 5-7 Power of Surgeons in Hospital D

Power dimension		Evidence	Conclusion
Power of Surgeons in the IM System (Code E)	Interviews with C-levels	<i>"Hospital D is defined by its integration of clinical excellence and operational sustainability, supported by its hospital-based physician model".</i>	The hospital-based physician model ensures alignment between clinical and operational goals, fostering collaboration across decision-making processes.
		<i>"Sustainability in inventory management is crucial, with rotations maintained between 15–18 days to handle logistical challenges effectively."</i>	Inventory turnover balances cost management and readiness, reflecting the hospital's strategic focus on operational efficiency.
		<i>"Committees review requests for new devices, balancing clinical needs with financial implications and organisational impact".</i>	Collaborative decision-making ensures that new inventory aligns with clinical priorities and institutional constraints.
		<i>"Here is not the surgeon's like but rather what the clinical guidelines say".</i>	Hospital D prioritizes clinical guidelines over individual surgeon preferences, ensuring standardized practices that enhance consistency, efficiency, and quality of care.
	Interviews with Logisticians	<i>"There are two instances; the first one is the pharmacy committee where a technical evaluation takes place for including a product in inventory, and a second instance where the procurement committee where they evaluate the requirements, everything is defined in that committee".</i>	Hospital D's power dynamics reflect a collaborative approach, with surgeons influencing inventory decisions through structured committees, ensuring technical evaluations and procurement align with institutional priorities.
		<i>"It is important to have one brand for a product, let's say product A, for specific uses but not equivalent products".</i>	Logisticians in Hospital D work on standardizing the inventory system and reducing inventory complexity.
		<i>"The logistics team focuses on maintaining inventory availability despite infrastructural and financial challenges."</i>	Logistics adaptability ensures critical supplies are available, supporting clinical demands even under resource constraints.

Power of Surgeons in the IM System (Code E)	Interviews with Surgeon	<i>"The surgical inventory process involves standardized trays, but exceptions are allowed for specific medical needs".</i>	Standardization enhances efficiency, whilst exceptions ensure surgeons' clinical autonomy is respected for unique cases.
		<i>"Surgeons actively evaluate new inventory, providing input on clinical needs and device performance".</i>	Surgeon involvement in procurement processes ensures inventory aligns with clinical demands, reinforcing their influence in decision-making.
		<i>"Despite some communication gaps, cancellation of surgeries due to inventory shortages has been reduced to less than 2%".</i>	Operational adjustments and improved communication between pharmacy and logistics have minimized disruptions in surgical procedures.
		<i>"Occasionally, we realise that a product isn't available, and we have to request it right away, even if it wasn't initially planned".</i>	Hospital D balances surgeon influence with a stewardship spirit, emphasizing collaboration and clinical guidelines over personal preferences, fostering alignment and shared decision-making.
	Observations	Surgeons and logisticians collaborate to standardize surgical trays whilst addressing procedural variability.	Collaborative efforts balance the need for flexibility in surgical procedures with the hospital's broader standardization initiatives.
		Manual processes in inventory tracking limit efficiency but maintain accuracy through rigorous checks.	Reliance on manual tracking demonstrates strong procedural adherence but highlights the need for automation to improve scalability and reduce administrative burden.
	Document Analysis	Inventory turnover: 22 days, reflecting balanced readiness and cost control.	Inventory turnover metrics demonstrate effective management, aligning operational readiness with financial objectives.
		Inventory reliability: 98%, achieved through physical checks and collaboration between logistics and pharmacy.	High-reliability rates underscore robust inventory control systems, enabling minimal discrepancies and efficient resource utilization.

Source: The author

5.4.2 The interests of surgeons in the Inventory System

Surgeons in Hospital D play a vital role in shaping IM practices, driven by their focus on patient outcomes, their experience with specific products, relationships with manufacturers, and cost-efficiency considerations. The hospital's publicly funded model, combined with its high proportion of hospital-based physicians, fosters a collaborative environment that balances clinical autonomy with operational priorities.

Surgeons' commitment to representing patient interests is a defining feature of their engagement with the IM system. A surgeon explained, "*The tools and devices we use directly impact surgical outcomes, making quality and precision paramount in our choices*". This underscores their focus on ensuring that inventory supports the highest standards of patient care. To achieve this, surgeons collaborate with logisticians to minimise procedural delays and maintain access to critical tools, even under the constraints of a cost-driven healthcare system. Logisticians emphasised the importance of this alignment, noting, "*Our focus is on aligning inventory practices with clinical needs, ensuring essential tools are always available despite cost pressures*". This collaborative approach reflects a shared commitment to patient-centred care and procedural success.

Experience with specific products also informs surgeons' interests. Whilst surgeons value high-quality, reliable tools, their preferences occasionally challenge standardisation efforts. A logistician noted, "*It is challenging to manage inventory when surgeons have varied preferences, but their focus on quality drives operational decisions*". This variability necessitates adaptive logistical strategies, such as refining surgical trays for high-complexity procedures. However, the hospital has implemented robust protocols to address bias and variability. A C-level remarked, "*We figured out some bias from the surgeons and worked in the training process to reduce the bias.*" These efforts demonstrate the hospital's proactive approach to balancing surgeon preferences with institutional efficiency.

Moreover, relationships with manufacturing representatives further shape surgeons' engagement with the IM system. Observations revealed structured collaborations between vendors and logisticians to ensure the timely delivery of critical PPIs, aligning clinical demands with cost-efficient practices. This dynamic reflects Hospital D's commitment to transparency and governance, as surgeons adhere to established protocols when introducing new products. A surgeon noted, *"We are the door from the vendors to the hospital, but we do not participate in the definition. We need to ask the vendor to show us medical literature and then present it to the scientific or medical director"*. This process ensures that evidence-based practices and institutional oversight guide product decisions.

On the other hand, cost considerations are central to Hospital D's publicly funded model, creating a balance between affordability and quality. A C-level explained, *"We need to analyse the financial impact of any decision regarding products and see if the NHS can reimburse, but we also see the benefits of a better quality in terms of clinical outcomes"*. This perspective underscores the hospital's commitment to maintaining clinical excellence whilst managing cost constraints. Document analysis revealed a 98% inventory accuracy rate and 22-day turnover, reflecting the effectiveness of logistical strategies in balancing financial sustainability with surgeons' demands.

In conclusion, surgeons in Hospital D prioritise patient outcomes, procedural reliability, and collaborative engagement within the constraints of a publicly funded system. Their interests in quality, efficiency, and evidence-based practices align with institutional goals, demonstrating a nuanced balance between clinical autonomy and operational accountability. Table 5-8 provides detailed evidence supporting these dynamics, illustrating the surgeons' interests in the IM system in Hospital D.

Table 5-8 Interests of Surgeons in Hospital D

Theme	Data Source	Data	Conclusion
Interest of Surgeons (Code J)	Interviews with C-levels	<i>"The number one priority is the patient for physicians and the inventory for the logisticians".</i>	The alignment between logisticians and surgeons regarding the inventory system's purpose is high.
		<i>"The standardization is important for assuring the clinical results, which I have told the NHS reimbursement companies. They can't ask me for different products because I can guarantee the quality".</i>	Hospital D has used standardization in the inventory system for many years. They are well recognized in healthcare because of the clinical quality outcomes.
		<i>"We figured out some bias from the surgeons, for example, that surgeon A likes more that type of suture and surgeon B that type of surgical energy".</i>	The C-level in Hospital D comprehends the experience with preferred items from surgeons and works in the training process to reduce the bias. They have an educational centre with a medical school.
		<i>"It has happened that for a certain type of medical department, we introduce a different product when we see but are special cases".</i>	Hospital D includes more SKUs in the product portfolio only in exceptional clinical cases, reducing the over-specification risk.
		<i>"We define with the pharmacy committee what is the best option to change a supplier if we see an opportunity".</i>	The pharmacy committee works as a countermeasure against the influence of influential surgeons in Hospital D.
		<i>"We need to analyse the financial impact of any decision regarding products and see if the NHS can reimburse, but we also see the benefits of a better quality in terms of clinical outcomes".</i>	The hospital's primary resource, the patients, is part of NHS-affiliated companies. These companies decide where to send a patient according to an NHS network. The NHS pays for healthcare services at cap prices. As expressed during the interviews, the previous creates pressure on cost and efficiency.
	Interviews with Logisticians	<i>"For them to understand that certain brand could offer a better integral negotiation and institutional and not the individualism of certain device (medical), and have it into consideration for negotiations" – Logistician</i>	Hospital D has worked in strategic bundle sourcing initiatives with a selected brand.
	Interviews with Logisticians	<i>"Surgical trays are standardized to ensure availability, but surgeons occasionally request additional items during procedures".</i>	Hospital D's logisticians prioritize maintaining procedural consistency whilst accommodating surgeons' last-minute requests, balancing operational efficiency with clinical needs.
		<i>"Our focus is on aligning inventory practices with clinical needs, ensuring essential tools are always available despite cost pressures".</i>	Logisticians demonstrate a commitment to aligning operational goals with surgeons' clinical priorities, highlighting the importance of patient outcomes in inventory decisions.
		<i>"Inventory management requires significant collaboration with surgeons to refine tray configurations for high-complexity procedures.</i>	Surgeons' procedural requirements necessitate logisticians' adaptability, fostering collaboration to meet patient care standards.

Theme	Data Source	Data	Conclusion
Interest of Surgeons (Code J)	Interviews with Logisticians	<i>It is challenging to manage inventory when surgeons have varied preferences, but their focus on quality drives operational decisions."</i>	Surgeons' emphasis on quality influences logistic processes, promoting standards that align with patient care objectives despite logistical complexities.
	Interview with Surgeon	<i>"We are the door from the vendors to the hospital, but we do not participate in the definition. We need to ask the vendor to show us medical literature and then present it to the scientific or medical director. Sometimes, the logisticians ask us about what do we think about a certain product".</i>	The surgeons in Hospital D have a clear pathway of inventory access into the system. They follow the established protocols.
		<i>"The tools and devices we use directly impact surgical outcomes, making quality and precision paramount in our choices".</i>	Surgeons prioritise access to high-quality, reliable tools and devices, reinforcing their focus on achieving optimal surgical outcomes.
		<i>"Collaboration with logisticians ensures that critical tools are always available during surgeries, minimising procedural delays".</i>	Collaboration between surgeons and logisticians strengthens operational workflows, ensuring the availability of essential inventory for procedural success.
		<i>"Cost constraints sometimes challenge our ability to choose ideal tools, but patient safety always comes first".</i>	Despite financial limitations, surgeons' interests align with prioritising patient safety and procedural success in inventory decisions.
	Observations	Manufacturing representatives collaborated with logisticians to ensure timely delivery of critical PPIs for surgeons' procedures.	This structured collaboration reflects Hospital D's efforts to balance cost efficiency with the surgeons' clinical demands.
		Surgical tool shortages were mitigated by proactive logisticians, ensuring availability during high-demand periods.	Logisticians' adaptive strategies help manage resource variability, aligning with surgeons' focus on maintaining procedural efficiency.
	Document Analysis	Inventory reports indicate 98% accuracy and 22 inventory turnover, with logistical strategies to balance cost control and surgeons' demand variability.	Hospital D maintains high inventory accuracy whilst adapting to variability in surgical needs, reflecting a commitment to operational excellence and patient safety.
		Compliance with clinical guidelines documented in hospital records ensures alignment between operational goals and surgeons' clinical practices.	Adherence to clinical guidelines fosters alignment between surgeons' interests and institutional priorities, supporting patient-centred care.
		VMI agreements prioritise maintaining inventory efficiency whilst ensuring high-demand surgical tools remain available.	Vendor collaborations enhance operational efficiency and support surgeons' procedural demands, reflecting the institution's balanced approach to inventory management.

Source: The author

5.4.3 Influencing the Inventory System in Hospital D

The influence of surgeons on the IM system at Hospital D reflects a balance between their clinical priorities and the constraints of a publicly funded model. Hospital D's high proportion of hospital-based physicians fosters a collaborative environment, aligning surgeons' interests with institutional goals whilst limiting their autonomy through structured governance frameworks.

The power of surgeons in Hospital D is notably low compared to other hospitals, shaped by the oversight of the Colombian NHS. The NHS regulates patient flow and procedural funding, reducing individual surgeons' influence over patient allocation and resource decisions. As one C-level remarked, *"Here is not the surgeon's like but rather what the clinical guidelines say"*. This underscores the hospital's reliance on evidence-based practices, ensuring that inventory decisions prioritise standardisation and quality over personal preferences.

Surgeons' influence is incorporated through collaborative structures such as the Pharmacy and Procurement Committees. These bodies evaluate requests for new devices based on clinical necessity, financial implications, and operational impact. A logistician explained, *"There are two instances; the first is the pharmacy committee where a technical evaluation takes place... and the second is where the procurement committee evaluates the requirements"*. This structured process ensures that surgeons' input aligns with institutional objectives, balancing clinical needs with cost efficiency.

Despite the emphasis on standardisation, surgeons maintain some flexibility in inventory decisions, particularly for high-stakes procedures. Observations highlighted collaborative efforts between surgeons and logisticians to standardise surgical trays whilst accommodating procedural variability. As a surgeon noted, *"The surgical inventory process involves standardised trays, but exceptions are allowed for specific medical needs"*. This balance ensures that procedural precision is maintained without undermining broader standardisation initiatives.

Hospital D's publicly funded model adds complexity, necessitating strict cost management. Surgeons acknowledge the limitations of financial constraints but emphasise the need to prioritise patient safety. One surgeon remarked, "*Cost constraints sometimes challenge our ability to choose ideal tools, but patient safety always comes first*". As document analysis highlights, this perspective aligns with the hospital's focus on maintaining high inventory accuracy (98%) and a 22-day turnover rate. These metrics demonstrate the effectiveness of logistical strategies in meeting surgeons' demands whilst adhering to budgetary restrictions.

Relationships with manufacturing representatives further shape surgeons' influence. Whilst vendors collaborate with logisticians to ensure the timely delivery of critical PPIs, surgeons play a secondary role, providing feedback on clinical needs and device performance. A surgeon explained, "*We are the door from the vendors to the hospital, but we do not participate in the definition... we present it to the scientific or medical director*". This structured approach ensures transparency and alignment with institutional protocols.

The stewardship mindset fostered by hospital-based physicians is integral to Hospital D's IM system. This culture promotes alignment between clinical and operational teams, reducing tensions and enhancing efficiency. Logisticians emphasised their role in adapting to surgeons' procedural requirements, noting, "*Inventory management requires significant collaboration with surgeons to refine tray configurations for high-complexity procedures*". Such collaboration underscores the shared commitment to patient-centred care and procedural success.

In conclusion, surgeons' power and interests at Hospital D are integrated into a cohesive framework prioritising clinical excellence and operational sustainability. The hospital's structured decision-making processes, reliance on clinical guidelines, and focus on cost management ensure that surgeon influence enhances rather than disrupts institutional efficiency.

5.5 Cross-case analysis

5.5.1 Power of Surgeons

According to Chapter 2, RDT's power definitions (Pfeffer, 1992), in Hospital A, it is high; in Hospital B, it is moderate to low; in Hospital C, it is high; and in Hospital D, it is low (See Table 5-9). Hospitals A and C have a private-funding orientation, whilst hospitals B and D have a public-funding direction. On the other hand, hospitals A and B have a low rate of hospital-based physicians, whilst hospitals C and D have a high rate of hospital-based physicians.

Table 5-9 Power of Surgeons in the Inventory System

Organisational context	<i>High hospital-based physician ratio</i>	Hospital C / High	Hospital D / Low
	<i>Low hospital-based physician ratio</i>	Hospital A / High	Hospital B / Moderate to Low
		<i>Private-funded</i>	<i>Public-funded</i>
Environmental context			

Source: The author

The cross-case analysis of the four hospitals in this study provides a nuanced understanding of how different contexts shape surgeons' power dynamics and influence inventory management (IM) practices. In Hospital A, a private-funded environment with low hospital-based surgeons, surgeons exert " **high**" power. This is attributed to their control over patient flow and personal interests, as reflected in the Resource Dependency Theory (RDT) and Stakeholder Theory (ST) perspectives. Surgeons in Hospital A dictate IM practices, often driven by individual preferences and building reputation motivations.

In contrast, Hospital B exhibits "**moderate to low**" power dynamics with its public funding and low hospital-based surgeons. The focus here is on cost control and efficiency. Surgeons in Hospital B, whilst influential, face challenges in reshaping the IM system due to public funding constraints and a lack of control over patient

flow. The RDT lens explains surgeons as demanding stakeholders, with their influence moderated by external funding pressures.

Hospital C, another private-funded institution with a high ratio of hospital-based surgeons, shows "**high**" power dynamics. Surgeons operate as a cohesive professional group, exerting influence collectively rather than individually. The high legitimacy of surgeons in this context, as viewed through the ST lens, indicates a strong alignment of their interests with the hospital's goals, particularly in applying clinical guidelines.

Finally, Hospital D, a public-funded hospital with a high ratio of hospital-based surgeons, presents a "**low**" power dynamics scenario. The influence of individual surgeons is relatively limited, with clinical guidelines and institutional policies primarily dictating IM practices. Surgeons in Hospital D focus more on patient care than IM concerns, aligning with the hospital's efficiency and cost management priorities due to public funding pressures.

The cross-case power analysis in Table 5-10 reveals a complex interplay of contextual factors, funding orientation and hospital-based surgeon ratio that significantly influence the power dynamics in IM practices across these diverse hospital environments.

Table 5-10 Power of Surgeons - Cross-case analysis

Theme	Hospital A (Private, Low hospital-based Physicians)	Hospital B (Public, Low hospital-based physicians)	Hospital C (Private, High hospital-based physicians)	Hospital D (Public, High hospital-based physicians)
Power of Surgeon in the IM system (code E)	Surgeon: <i>"We add 5-10 products to the standard tray."</i> (Observation: frequent requests for tray adjustments)	Surgeon: <i>"I have to justify any requests for new devices."</i> (Interview: surgeons submit technical forms)	Surgeon: <i>"My preferences are followed almost without question."</i> (Observation: preference influence on procurement)	Surgeon: <i>"We must evaluate PPI impact on cost and patient outcomes."</i> (Observation: PPI request forms include financial assessments)
	C-Level: <i>"Surgeons control inventory flow, affecting procurement efficiency."</i> (Document: Procurement requests heavily influenced by surgeons)	C-Level: <i>"We monitor requests carefully to avoid conflict of interest."</i> (Observation: Requests pass technical scrutiny)	C-Level: <i>"Surgeons are key to inventory decisions because they attract high-value patients."</i> (Document: Frequent surgeon-driven inventory updates)	C-Level: <i>"Decisions about PPI must fit NHS criteria."</i> (Document: strict rules governing PPI procurement due to budget)
	Logistician: <i>"We often struggle to keep up with PPI requests from surgeons."</i> (Observation: logistics often bypassed)	Logistician: <i>"I ensure inventory aligns with hospital needs but surgeon preferences occasionally push boundaries."</i> (Document: Inventory documents reflect backlogged procurement orders)	Logistician: <i>"Surgeons have direct access to high-cost PPIs, making inventory management complex."</i> (Interview: Surgeons directly influence high-cost PPI purchases)	Logistician: <i>"Financial limitations reduce surgeons' control, but they influence high-priority items."</i> (Interview: Surgeons influence strategic PPI choices in high-risk surgeries)
	Surgeon: <i>"There are 42 urologists, each with different preferences."</i> (Observation: Difficult to standardize surgical trays due to surgeon diversity)	Surgeon: <i>"Standardization is important, but we need the flexibility for certain procedures."</i> (Interview: Surgeons influence standardization in critical cases)	Surgeon: <i>"I approve most changes to surgical kits."</i> (Observation: Surgeon-directed inventory standardization changes)	Surgeon: <i>"In cardiac surgery, we have special items that break standardization rules."</i> (Observation: Critical surgeries often lead to deviations)
	C-Level: <i>"Surgeons influence the type of tools and devices"</i>	C-Level: <i>"We try to enforce standardization, but surgeons"</i>	C-Level: <i>"We standardize where possible, but surgeons"</i>	C-Level: <i>"Standardization must balance cost control with"</i>

	<i>used, complicating standardization.</i> " (Document: Tray variation records highlight differences)	<i>make exceptions.</i> " (Document: Surgeon requests for specific brands lead to deviations)	<i>influence all major decisions.</i> " (Document: Clear surgeon-led changes in tray configurations)	<i>surgeon needs.</i> " (Document: Surgeons only override standardization in exceptional cases)
	Logistician: " <i>Standardization is constantly challenged by specific surgeon preferences.</i> " (Observation: Difficulties in tray standardization)	Logistician: " <i>We standardize trays but need surgeon input for special cases.</i> " (Observation: Effective but occasionally flexible standardization)	Logistician: " <i>Surgeon preferences are built into the standardization process.</i> " (Interview: Surgeons' heavy involvement in shaping tray configurations)	Logistician: " <i>Standardization is key but surgeons can alter it for high-risk procedures.</i> " (Observation: Surgeon input considered in high-risk surgeries)
	Surgeon: " <i>I play a critical role in high-cost inventory decisions.</i> " (Observation: Surgeons heavily involved in strategic decisions)	Surgeon: " <i>I give input on new devices, but it depends on the budget and hospital policy.</i> " (Interview: NHS limits surgeon autonomy in strategic decisions)	Surgeon: " <i>I directly influence purchasing policies, especially for high-value PPis.</i> " (Observation: Surgeons make decisions beyond clinical inputs)	Surgeon: " <i>We decide strategically but under strict budget constraints.</i> " (Observation: Surgeons involved in strategic decisions only for critical surgeries)
	C-Level: " <i>Surgeons are integral to our overall inventory strategy due to their influence over patient flow.</i> " (Document: PPI procurement largely surgeon-driven)	C-Level: " <i>Our strategic decisions must pass NHS financial scrutiny.</i> " (Document: NHS-driven decision-making framework limits surgeon influence)	C-Level: " <i>We rely on surgeons to inform strategic procurement decisions due to their expertise.</i> " (Document: High surgeon involvement in major purchasing policies)	C-Level: " <i>Strategic decisions must be cost-effective and align with NHS standards.</i> " (Document: Public funding drives decision-making)
	Logistician: " <i>Surgeons often have the final word in deciding on inventory purchases.</i> " (Observation: Strategic inventory decisions strongly influenced by surgeons)	Logistician: " <i>Surgeons influence decisions, but we have strict budget guidelines.</i> " (Observation: Surgeons propose strategic items, but decisions are financially driven)	Logistician: " <i>Surgeon-driven decisions are strategic and often align with high-cost procurement.</i> " (Observation: Surgeons directly involved in strategic purchases)	Logistician: " <i>Surgeons play a role in strategic decisions but under strict institutional oversight.</i> " (Observation: Surgeons involved in decisions only for high-risk inventory)

Source: The author

Moreover, Hospitals A and C charge higher prices to payers than Hospitals B and D, which are publicly funded with lower prices to payers dictated by the Colombian Healthcare System. Hospitals B and D experienced a higher pressure in cost reduction and efficiency improvement than their counterparts, Hospitals A and C, where talent surgeons' talent acquisition and retention is important. Moreover, it was found that surgeons control the patients' flow into the system in hospitals A and C, where patients can choose which physician they would like to consult and the institution they would like to go to.

On the other hand, the patients in hospitals B and D cannot select where to go, and the Colombian NHS system decides in which hospital they will get their surgical procedure, as explained in Table 5-11. In conclusion, according to the RDT, surgeons in hospitals A and C have power and, therefore, more influence in the inventory system, whilst surgeons in hospitals B and D do not control the inflow of resources and have less power.

Table 5-11 The control of Resources (RDT) in the case studies

Who controls the Resources?	Supporting respondent quotes	Hospital
Surgeons	<i>"Surgeons control the revenue and the expenses in the OT" – C-level</i>	A
	<i>"If the clinical executive committee decides that technology is important to a certain type of cancer, they don't ask: how much does it cost? How is it going to be paid? Why is it so expensive? It is the responsibility of the hospital's manager to formulate and evaluate from a financial perspective that initiative" – C-level</i>	C
Colombian NHS	<i>"A few days ago, someone asked me if we would invest in new medical technology, and my response was that if and only if the NHS will pay for it" – C-level.</i>	B
	<i>"We need to analyse the financial impact of any decision in terms of products and see if the NHS can make the reimbursement, but we also see the benefits of a better quality in terms of clinical outcomes" – C-level.</i>	D

Source. The author

5.5.2 Interest of Surgeons

The cross-case analysis of the four hospitals—A, B, C, and D—reveals significant variations and patterns in how surgeons' interests influence the inventory management (IM) system across the four key categories: representing patient interests, expertise with particular products, relationships with manufacturing representatives, and cost considerations. These categories provide insight into the complexity and diversity of surgeons' engagement with IM practices and their alignment with institutional priorities.

Representing Patient Interests (Category code F)

Across the cases, surgeons consistently demonstrated a strong commitment to patient outcomes. In Hospital A, surgeons' autonomy led to high variability in inventory, often prioritising individualised care over standardisation. As stated by a C-level in Hospital A, *"Free clinical practice allows surgeons to choose what they believe is best for the patient."* This reflects a system driven by clinical freedom but at the cost of operational efficiency. In contrast, Hospital D emphasised alignment between surgeons and logisticians, with standardisation practices ensuring consistent quality outcomes. A C-level in Hospital D stated, *"Standardisation assures clinical results,"* highlighting how institutional protocols align with patient-focused objectives whilst maintaining operational efficiency. Hospitals B and C fall between these extremes, balancing surgeons' focus on patient interests with operational constraints. Both demonstrated structured approaches to maintaining patient-centred care whilst fostering standardisation and collaboration with logisticians.

Expertise with Particular Products (Category code G)

Surgeons' reliance on specific products based on their expertise varied across hospitals. In Hospital A, the lack of standardisation allowed surgeons to prioritise their familiarity with specific tools, contributing to high variability and logistical challenges. As one surgeon remarked, *"I prefer tools I'm familiar with; they*

improve precision and outcomes.” Similarly, in Hospital B, surgeons’ expertise shaped inventory configurations, often requiring real-time adjustments to meet procedural demands. However, Hospitals C and D mitigated this variability through structured processes. Hospital C integrated expertise into medical committees, ensuring decisions were clinically significant and unit-wide rather than surgeon-specific. Hospital D complemented this with training initiatives to address bias and variability, promoting a balanced approach to aligning surgeon expertise with institutional goals.

Relationships with Manufacturing Representatives (Category code H)

The influence of vendor relationships on surgeons’ preferences was evident in all hospitals, but they differed in governance. In Hospital A, surgeons maintained solid and direct relationships with manufacturers, influencing inventory decisions and fostering procedural innovation. This dynamic, whilst clinically beneficial, introduced inefficiencies due to variability. Hospital B adopted structured engagement processes, requiring manufacturers to first collaborate with logisticians, ensuring clinical demands aligned with institutional priorities. Hospitals C and D emphasised transparency and ethical standards in vendor relationships. Hospital C’s medical staff upheld a philosophy of independence from industry influence, whilst Hospital D’s pharmacy committee worked collaboratively to ensure vendor relationships aligned with financial and clinical goals.

Representing costs interests (Category code I)

Surgeons’ cost considerations—or lack thereof—differed markedly across the cases. In Hospital A, surgeons prioritised clinical autonomy over financial efficiency, as evidenced by statements like “*We are not focused on costs; we surgeons want the best.*” This contrasted sharply with Hospitals B, C, and D, where cost constraints shaped IM practices. Hospital B operated under Colombian NHS reimbursement constraints, balancing clinical needs with financial sustainability. Hospitals C and D excelled in integrating cost management with clinical excellence. Hospital C prioritised adding value over

cost-cutting, whilst Hospital D aligned inventory decisions with NHS policies, achieving high turnover and accuracy rates.

The cross-case analysis highlights a continuum of practices, from the highly surgeon-driven system in Hospital A to the more institutionally governed models in Hospitals C and D. Hospitals A and B faced challenges aligning clinical priorities with operational efficiency, whilst Hospitals C and D leveraged structured frameworks to balance surgeons' interests with institutional goals. The findings underscore the importance of collaborative processes, ethical governance, and financial alignment in optimising IM systems across diverse hospital contexts. Data analysis is shown in Table 5-12.

Table 5-12 Interests of Surgeons - Cross-case Analysis (Theme J)

Category	Hospital A (Private, Low hospital-based Physicians)	Hospital B (Public, Low hospital-based physicians)	Hospital C (Private, High hospital-based physicians)	Hospital D (Public, High hospital-based physicians)	Conclusions
Representing Patients' interests (Code F)	<i>"Surgeons publish through payments (grants) from the industry." Reflects collaboration with industry to align clinical advancements with patient care". C-level</i>	<i>"We say to surgeons to use tray A, B, or C, but they respond that they can't know with certainty which trays to use until they are in the OT with the patient". C-level</i>	<i>"We work in continuous improvement and the best clinical outcomes for patients". C-level</i>	<i>"The number one priority is the patient for physicians and the inventory for the logisticians". C-level</i>	Hospitals A and B: Surgeons' preferences dominate IM practices, with variability driven by their focus on patient-specific needs. Patient feedback and flexibility in inventory decisions reinforce a solid patient-centred approach but challenge standardisation. Hospitals C and D: Emphasis on measurable outcomes and structured processes ensures patient-centred care aligns with institutional goals. High reliance on clinical guidelines and collaborative frameworks reduces variability whilst maintaining quality and efficiency.
	<i>"The inventory in the hospital is open; it is as if every patient has a specific requirement, and that is because of the physicians."</i>	<i>"We have to ensure devices are available, or patient care suffers."</i>	<i>"We depend on the surgeon's likes; some use brand A, others brand B."</i>	<i>"Our focus is on aligning inventory practices with clinical needs, ensuring essential tools are always available despite cost pressures."</i>	
	<i>"I prefer tools I'm familiar with; they improve precision and outcomes during surgery."</i>	<i>"Surgeons need the right tools, at the right time, to guarantee the best outcomes."</i>	<i>"In surgery, tools and devices are an extension of our skills; preferences matter."</i>	<i>"The tools and devices we use directly impact surgical outcomes, making quality and precision paramount in our choices."</i>	
Experience with a particular product (Code G)	<i>"Surgeons' preferences often stem from their experience with particular brands" C-level</i>	<i>"We say to surgeons to use tray A, B, or C, but they respond that they can't know with certainty which trays to use until they are in the OT with the patient." C-level</i>	<i>"If it (medical device) is clinically significant, then the medical committee acquires the responsibility to get it. C-level</i>	<i>"We figured out some bias from surgeons and worked in the training process to reduce it."</i>	Hospitals A and B: Surgeons' expertise creates high variability in inventory practices, with collaboration between logisticians and surgeons mitigating some operational inefficiencies.

Experience with a particular product (Code G)	<i>"The product portfolio reflects the academic background of surgeons." Logistician</i>	<i>"Surgical groups often work collaboratively with logistics to refine inventory setups based on practical experience."- Logistician</i>	<i>"We depend on the surgeon's likes; some use brand A, others brand B."</i>	<i>"Inventory management requires significant collaboration with surgeons to refine tray configurations for high-complexity procedures."</i>	Hospitals C and D: Structured systems reduce variability by integrating surgeons' expertise into standardised processes. Training and collaborative efforts align expertise with institutional goals, promoting balance between clinical and operational priorities.
	<i>"I prefer tools I'm familiar with; they improve precision and outcomes during surgery."- Surgeon</i>	<i>"Our work is based on precision; tools and devices matter immensely."</i>	<i>"In surgery, tools and devices are an extension of our skills; preferences matter."</i>	<i>"The tools and devices we use directly impact surgical outcomes, making quality and precision paramount in our choices."</i>	
Relationship with manufacturing representatives (Code H)	<i>"Surgeons publish through payments (grants) from the industry (medical devices and pharmaceutical industries)."</i>	<i>"We should cope with this reality of the surgeons and control this variability without damaging the medical autonomy principle because the industry will always be there."</i>	<i>"Our medical staff share the philosophy that their incomes should come from the medical practice and not from the industry."</i>	<i>"We define with the pharmacy committee what is the best option to change a supplier if we see an opportunity."</i>	Hospitals A and B: Vendor relationships are surgeon-driven, with manufacturers directly influencing inventory decisions. Hospital A shows less institutional oversight, whilst Hospital B integrates structured governance to manage variability. Hospitals C and D: Ethical standards and collaborative processes govern vendor relationships, ensuring alignment with institutional goals. Both hospitals emphasise transparency and oversight, reducing variability in inventory practices.
	<i>"Surgeons come with their wish list, and we (Logistics) must bring them whatever they want. They have no restrictions, which is a talent attraction argument."</i>	<i>"Today, we should have bar codes for tracing and doing better logistics, so we do it at the hospital with a huge cost. The industry is reluctant to commit."</i>	<i>"We depend on the surgeon's likes; some use brand A, others brand B, which are often driven by vendor relationships."</i>	<i>"For them to understand that certain brands offer a better integral negotiation and not the individualism of certain medical devices."</i>	
	<i>"Collaboration with suppliers helps us stay updated on the latest medical advancements."</i>	<i>"We rely on our trusted suppliers to provide consistent quality."</i>	<i>"The availability of trusted suppliers helps us maintain consistency in outcomes."</i>	<i>"We are the door from the vendors to the hospital, but we do not participate in the definition."</i>	
Representing costs interests (Code I)	<i>"We have many products, and it is impossible to guarantee all of them."</i>	<i>"A few days ago, someone asked me if we would invest in new medical technology, and my response was that if and</i>	<i>"Our greatest challenge is to add more value (clinical outcomes) with less cost</i>	<i>"We need to analyse the financial impact of any decision regarding products and see if the NHS can reimburse, but</i>	Hospitals A and B: Surgeons show minimal cost orientation, prioritising clinical autonomy and patient outcomes over financial considerations. Hospital B

		<i>only if the NHS will pay for it."</i>		<i>we also see the benefits of better quality."</i>	incorporates stronger institutional cost controls aligned with public funding models. Hospitals C and D: These hospitals achieve a balance between quality and cost-efficiency. Hospital C, though privately funded, prioritises adding clinical value, whilst Hospital D integrates NHS reimbursement policies into its cost management framework.
Representing costs interests (Code I)	<i>"Surgeons come with their wish list, and we (Logistics) must bring them whatever they want."</i>	<i>"Our focus is on aligning inventory practices with clinical needs, ensuring essential tools are always available despite cost pressures."</i>	<i>"We don't have automation or information systems for the inventory management, but we do it very well with potential risks and many FTEs."</i>	<i>"Strategic bundle sourcing initiatives with selected brands help manage costs whilst ensuring quality."</i>	
	<i>"We are not focused on costs; we surgeons want the best. We usually never measure costs."</i>	<i>"Cost constraints sometimes challenge our ability to choose ideal tools, but patient safety always comes first."</i>	<i>"In surgery, tools and devices are an extension of our skills; preferences matter."</i>	<i>"Cost constraints sometimes mean compromises, but safety always comes first."</i>	

Source: The author

6 DISCUSSION

The doctoral thesis explains how contextual factors influence surgeons' power dynamics in IM practices. This exploration utilizes the De Vries (2011) model, grounded in the RDT (Pfeffer and Salancik, 1978) and incorporates the theoretical lenses of ST (Freeman, 1984) to explain further and elucidate RQ1 and RQ2.

6.1 Hospital A

Hospital A, operating within a private funding environment and with a low presence of hospital-based surgeons, revealed a nuanced interplay between environmental funding orientation and stakeholder power dynamics. This aligns with the Resource Dependency Theory (RDT), highlighting how control over external resources centralises power among certain stakeholders (Pfeffer and Salancik, 1978). The findings in Hospital A resonate with Olson et al. (2013), who observed that physicians' specialised expertise often positions them as key resource controllers within healthcare organisations.

The private funding context of Hospital A amplified the surgeons' influence due to their pivotal role in attracting patients, a critical resource for the hospital's operational success. This observation parallels Lux and Petit's (2016) assertion that the professional affiliations of physicians significantly impact healthcare institutions' resource acquisition strategies. Moreover, the low ratio of hospital-based surgeons in this context echoes Nyaga et al. (2015), who identified a direct relationship between organisational alignment and hospital-based physician ratios. In Hospital A, the lower presence of hospital-based surgeons fostered individualistic behaviours, further magnifying the power of surgeons as external agents.

The absence of standardisation in the hospital's IM practices, characterised by the diverse usage of multiple brands and PPIs, aligns with findings from Cox et al. (2005), who described similar challenges in healthcare supply chains driven

by stakeholder preferences. This variability, whilst favoured by surgeons for its perceived enhancement of product availability, imposed significant logistical burdens. Logisticians faced operational complexities reminiscent of those documented by Volland et al. (2017), where non-standardised practices led to inefficiencies in IM.

Furthermore, the narrative of "ownership spirit" was notably absent among surgeons in Hospital A, redirecting their focus solely to patient outcomes. Whilst commendable, this shift increased inventory demands, supported by promises from C-level executives. This behaviour reinforces the legitimacy framework described by Freidson (1999), where professional autonomy drives stakeholder actions, often at odds with organisational SCM objectives. The proliferation of SKUs and tailored PPIs mirrors challenges identified by De Vries (2011), who highlighted the disruptive impact of individual stakeholder influence on standardised SCM practices.

Hospital A's case provides a critical lens through which to examine the role of contextual factors in shaping stakeholder dynamics. The powerful influence of surgeons, fuelled by their dominance over critical resources as the PPIs, underscores the importance of aligning stakeholder interests with organisational goals. This insight aligns with the dual theoretical lenses of RDT (Pfeffer and Salancik, 1978) and ST (Freeman, 1984), emphasising the need to manage dependencies and balance stakeholder legitimacy within complex healthcare supply chains.

6.2 Hospital B

Hospital B, a public-funded institution, presents a compelling case that challenges established notions within RDT and IM in hospitals. Unlike private-funded hospitals, where stakeholders such as physicians typically hold considerable influence over SCM practices, the dynamics in Hospital B are shaped by the constraints of public funding. The Colombian NHS controls resource allocation in this environment, limiting individual stakeholders' power and autonomy. This case directly contrasts with De Vries's (2011) findings, which emphasised physicians' significant influence on logistics and inventory systems,

particularly in resource-abundant contexts. Similarly, Boonstra et al. (2008) observed that high-power stakeholders often dominate healthcare IS and SCM systems, a dynamic less pronounced in Hospital B due to the influence of public governance.

Hospital B's context also aligns with insights from Aptel and Pourjalali (2001), who highlighted the role of public healthcare systems in enforcing cost-containment strategies and standardisation efforts. However, the context of Colombian middle-income countries introduces unique nuances. The pervasive focus on cost efficiency is not merely a function of public funding but a response to broader economic pressures that define resource dependency and interdependency. This reinforces the importance of understanding the contextual interplay between funding models and resource management, as emphasised by Pfeffer and Salancik (1978). Such insights underscore the applicability of the theoretical model developed in this study to diverse healthcare settings, particularly those in resource-constrained environments.

The role of the Pharmacy Committee at Hospital B is particularly noteworthy. Comprised of pharmacists, logisticians, and senior executives such as the CFO and CMO, the committee exemplifies a structured approach to standardisation, resonating with practices observed in studies by Cox et al. (2005) and Nicholson et al. (2004), where such committees acted as gatekeepers for resource efficiency. However, compared to private hospitals where surgeons might dominate these decision-making processes, Hospital B's low proportion of hospital-based surgeons weakens their direct influence. This finding parallels Nyaga et al.'s (2015) observation that higher hospital-based surgeon ratios correlate with more substantial alignment to SCM objectives. In Hospital B, surgeons' limited presence and engagement in the Pharmacy Committee further emphasise the priority of cost control over stakeholder preferences.

The absence of a pronounced "ownership spirit" among surgeons at Hospital B emerges as a defining characteristic. Surgeons express dissatisfaction with the IM system, citing issues such as inadequate product availability and perceived flaws in the standardisation process. These findings align with Montgomery and

Schneller (2007), who noted that physicians often view SCM systems as misaligned with their clinical needs, significantly when standardisation limits their autonomy. Furthermore, the surgeons' concerns about risking their relationships with patients due to supply chain inefficiencies highlight the legitimacy framework discussed by Freidson (1999), where the perception of representing patients' interests becomes a critical point of contention in healthcare SCM practices.

The dynamics between surgeons and logisticians at Hospital B reveal recurrent tensions. Surgeons' demanding behaviour, coupled with logisticians' perceived patronisation, reflects the power imbalances described by Pfeffer and Salancik (1978). However, consistent support from C-level executives for logisticians indicates a robust organisational commitment to SCM objectives. This alignment between executives and logisticians echoes findings by Aptel and Pourjalali (2001), where leadership support was critical to maintaining cost-containment and operational efficiency in public-funded hospitals.

Hospital B's case offers valuable insights into the interplay between stakeholder urgency, power, and ownership in SCM practices. Whilst surgeons are demanding stakeholders, their limited influence within the organisation creates unique tensions. Surgeons' absence of a strong ownership mindset exacerbates these challenges, hindering efforts to optimise IM practices. This scenario challenges traditional assumptions about stakeholder influence, as noted in Freeman's (1984) Stakeholder Theory, and extends the discussion by highlighting how public funding constraints reshape stakeholder behaviours and priorities.

In brief, Hospital B's findings advance the theoretical understanding of healthcare SCM by illustrating how public-funded institutions navigate the intricate balance of resource dependency and interdependency. The lower IM system performance in Hospital B, as reflected in KPIs, can be attributed to the failure of surgeons to shape and utilise the system effectively. These tensions, driven by the non-ownership culture and competing stakeholder priorities, highlight the critical importance of considering contextual and theoretical dimensions, such as

RDT and Stakeholder Theory, in pursuing operational efficiency and healthcare delivery excellence.

6.3 Hospital C

Hospital C, situated in a private-funded environment with a high number of hospital-based surgeons, demonstrated a pronounced influence of surgeons on IM practices. The culture of collaboration and stewardship within Hospital C was instrumental in developing clinical guidelines and standards, reflecting the organisation's commitment to professional legitimacy and operational excellence. This dynamic aligns with Freidson's (1999) framework, which underscores the critical role of professionalisation and legitimacy in shaping stakeholder behaviours and organisational practices. The strong emphasis on clinical standards also resonates with Nicholson et al. (2004) and Montgomery and Schneller (2007), who highlighted the benefits of standardisation in improving hospital IM efficiency.

The unique governance structure at Hospital C, where the Chief Medical Officer (CMO) reports directly to the Board of Directors rather than the CEO, exemplifies the high prioritisation of clinical leadership in organisational decision-making. This structure enabled the medical committee, led by surgeons and other medical professionals, to establish evidence-based clinical guidelines. These guidelines were pivotal in reducing PPIs and streamlining IM practices. Unlike Hospital A, where surgeons' preferences created a proliferation of PPIs, adopting standardised PPIs in Hospital C reflects a significant shift towards operational efficiency. This shift aligns with the findings of Cox et al. (2005) and Volland et al. (2017), who identified product standardisation as a critical enabler of inventory optimisation in healthcare.

However, whilst clinical guidelines facilitated SKU reduction and improved perceptions of the IM system, certain limitations emerged. Although surgeons in Hospital C were aligned with standardisation initiatives, their selective engagement with cost-efficiency measures underscores the complexities of aligning stakeholder interests. For example, surgeons' indifference towards cost considerations, as evidenced by their statement, "*We do not care about costs*",

echoes themes discussed by Montgomery and Schneller (2007), where clinicians prioritised clinical autonomy over financial or operational constraints. This selective engagement reinforces the argument by Boonstra et al. (2008) that stakeholder power dynamics often lead to partial alignment with organisational goals.

Despite these challenges, the cooperative culture within Hospital C significantly shaped IM outcomes. The hospital displayed higher expenses in FTE staffing as logisticians sought to meet surgeons' demands and align operations with quality accreditations and standards. This finding parallels the work of Kim and Kwon (2015), who noted the resource-intensive nature of achieving high standards in healthcare SCM. The additional costs associated with FTE staffing highlight the trade-offs between clinical excellence and operational efficiency.

Hospital C's financial capacity to implement advanced IM initiatives, such as automation and information systems, remained underutilised due to the dominant influence of surgeons. This reluctance to invest in efficiency-enhancing technologies mirrors findings by Lux and Petit (2016), who identified resistance among powerful stakeholders as a barrier to SCM innovation. Whilst surgeons actively supported standardisation initiatives tied to clinical guidelines, their limited prioritisation of cost-control measures illustrates the multifaceted nature of their influence, as posited by Pfeffer and Salancik (1978) in the RDT.

Within Hospital C, surgeons emerged as definitive stakeholders, characterised by their power, urgency, and ownership. This classification aligns with Freeman's (1984) stakeholder theory and Mitchell et al.'s (1997) stakeholder typology, categorising stakeholders based on their attributes. The private-funded environment and high proportion of hospital-based surgeons created an organisational context where surgeons exercised substantial control over clinical guidelines and protocols. Their stewardship in maintaining clinical standards reinforced their legitimacy and urgency, further solidifying their role as pivotal in SCM decision-making. The collective ownership spirit among surgeons, driven by a commitment to the hospital's reputation and success, distinguished their influence from the individualistic tendencies observed in Hospital A.

Hospital C's case illustrates the transformative potential of clinical standards and guidelines in the hospital's IM. Adopting standardisation streamlined IM practices, yet it also underscored the complexities of balancing surgeons' influence with cost-control and efficiency priorities. Surgeons at Hospital C exemplified cooperative stakeholders with selective engagement, demonstrating how power, urgency, and ownership interplay within healthcare SCM dynamics. These findings contribute to a deeper understanding of the role of contextual factors and stakeholder behaviours in shaping IM practices across diverse hospital environments.

6.4 Hospital D

Much like its public-funded counterpart, Hospital B, Hospital D operates within the constraints of the Colombian NHS, where government regulation dictates resource allocation and prices for hospital services. Efficiency and cost-effectiveness are central imperatives in this context. However, Hospital D defies traditional assumptions in HCSCM, presenting a model of how public-funded institutions can achieve operational excellence in IM.

Unexpectedly, despite the challenges associated with public funding, Hospital D's organisational context fosters initiatives to improve its IM system. Surgeons at this hospital exhibit a strong sense of stewardship and belonging, actively participating in efforts to standardise PPIs and implement efficiency and cost control measures. This behaviour aligns with Freidson's (1999) professionalism framework, where commitment to the organisational mission enhances stakeholder engagement and cooperation. Unlike the dynamics observed in Hospital B, where surgeons' influence is characterised by tension and limited engagement, Hospital D demonstrates a collaborative model that facilitates alignment between clinical and logistical objectives.

The Pharmacy Committee at Hospital D emerges as a pivotal instrument for standardising clinical guidelines. Whilst similar committees operate in Hospital B, what distinguishes Hospital D is the robust participation of surgeons across departments. This aligns with findings by Cox et al. (2005), which emphasise that stakeholder engagement in standardisation processes can significantly

streamline operations. By recognising the importance of reducing PPI variety and streamlining the inventory portfolio, surgeons at Hospital D contribute to a cohesive IM strategy. This level of alignment between surgeons and logisticians mirrors the organisational culture described by Nyaga et al. (2015), where collaboration between internal stakeholders drives efficiency and improves performance.

Hospital D's organisational and environmental factors position it to achieve the most favourable IM system KPIs among the studied cases. Surgeons' overwhelmingly positive perceptions of the IM system reflect its alignment with their objectives of patient care, quality, and operational efficiency. This contrasts with findings from De Vries (2011), Boonstra et al. (2008), and Aptel and Pourjalali (2001), where professional stakeholders were often observed reshaping IM systems to suit individual preferences. Instead, Hospital D underscores the importance of cultural alignment and stakeholder collaboration in optimising IM practices, challenging the notion that power dynamics alone dictate system effectiveness.

The case of Hospital D highlights the critical role of culture in aligning stakeholder behaviours with organisational goals. The higher proportion of hospital-based surgeons fosters a committed culture, reinforcing the shared purpose among clinicians and logisticians. This finding extends the theoretical work of Pfeffer and Salancik (1978), who posited that environmental and organisational contexts significantly influence resource dependency and interdependency dynamics. Hospital D exemplifies how a cohesive culture and high stakeholder engagement can offset the limitations typically associated with public funding models, achieving operational outcomes that rival or exceed those of private-funded institutions.

The Pharmacy Committee's success at Hospital D further underscores its efficacy as an alignment instrument. However, its effectiveness is contingent not merely on the power wielded by individual stakeholders but on the hospital's prevailing culture. This insight resonates with ST (Freeman, 1984), highlighting the importance of balancing stakeholder interests within the broader organisational

framework. The cultural alignment observed in Hospital D facilitates this balance, enabling the IM system to function as intended and deliver value across the organisation.

Hospital D's case challenges conventional assumptions in healthcare SCM, demonstrating that public-funded institutions can excel in IM practices when supported by a committed culture and engaged stakeholders. The collaborative environment at Hospital D offers fresh insights into the interplay of power, culture, and alignment in HCSCM, contributing significantly to the healthcare supply chain effectiveness discourse. This case illustrates the transformative potential of cultural commitment and collaborative alignment in shaping IM practices, reinforcing the importance of organisational and environmental factors in achieving SCM excellence.

6.5 General Discussion

This research further develops a framework for categorising surgeons within the healthcare supply chain, challenging and extending Mitchell et al. (1997) traditional stakeholder typology based on power, urgency, and legitimacy. Whilst these dimensions partially explain surgeons' behaviours within IM practices, this study identifies two critical, underexplored factors—hospital funding orientation and physician contract arrangements—that significantly shape surgeons' roles and influence. Table 6-1 provides an alternative stakeholder classification framework, contextualising surgeons' behaviours across varying organisational and environmental settings.

Table 6-1 Alternative Framework for Stakeholder Typology according to power influence

Organisational context	<i>High hospital-based physician ratio</i>	Hospital C: Cooperative Stakeholder with Selective Engagement	Hospital D: Cooperative Stakeholder
	<i>Low hospital-based physician ratio</i>	Hospital A: Dominant Stakeholder	Hospital B: Demanding Stakeholder
		<i>Private-funded</i>	<i>Public-funded</i>
Environmental context			

Source: The author

Hospital A exemplifies surgeons as ***dominant stakeholders*** who powerfully shape IM practices. Their demands, whilst legitimate, are treated with urgency, reflecting a high level of influence not adequately captured in Mitchell et al.'s (1997) framework. This dominance underscores the centrality of power dynamics in IM systems, as highlighted by Pfeffer and Salancik's (1978) RDT, but also demonstrates how urgency reframes their stakeholder role.

In contrast, surgeons at Hospital B exhibit traits of ***demanding stakeholders***, possessing moderate power but creating frequent tensions within the IM system.

These dynamics arise from the misalignment between surgeons' expectations and the hospital's cost-containment priorities, reflective of the public funding constraints described by Aptel and Pourjalali (2001). The inability of surgeons to effectively shape the IM system in this setting emphasises the need for alignment between stakeholder interests and organisational goals, echoing themes in Freeman's (1984) ST.

Hospitals C and D represent **cooperative stakeholders**, albeit with differing levels of engagement. In Hospital C, surgeons actively participate in standardising clinical guidelines, aligning with logisticians to enhance SCM practices. However, their focus remains selective, prioritising clinical excellence over cost control, aligning with findings from Montgomery and Schneller (2007). By contrast, surgeons in Hospital D demonstrate a broader cooperative attitude, supporting initiatives that balance quality, efficiency, and cost-effectiveness, suggesting the influence of a committed culture.

Moreover, in Hospital C, surgeons act as **cooperative stakeholders with selective engagement**, aligning with clinical standardisation initiatives but neglecting cost control and efficiency measures. This selective engagement reflects the professionalism framework outlined by Freidson (1999), where clinical legitimacy rather than organisational objectives drive surgeons' participation. Despite their cooperative stance, their cooperation remains limited to areas that align with their professional priorities, such as establishing clinical guidelines.

On the other hand, in Hospital D, surgeons represent **cooperative stakeholders**, engaging with logisticians and supporting IM practices despite lower levels of power. This cooperative behaviour aligns with Nyaga et al.'s (2015) findings, which associate high levels of alignment between stakeholders with improved SCM performance. The hospital's public-funded context fosters a culture of collaboration, demonstrating the potential for public institutions to achieve SCM success when stakeholder alignment is prioritised.

This research also underscores the significant role of medical or pharmacy evaluation committees in standardisation efforts. These committees, serving as

forums for collaborative decision-making, align with Freeman's (1984) ST, highlighting the importance of balancing stakeholder interests within organisational frameworks. The composition and functioning of these committees varied across the hospitals, reflecting the influence of power dynamics and cultural contexts.

In Hospital A, the absence of a formal committee underscored the dominance of individual surgeons in shaping IM practices. Their power was so entrenched that collaborative mechanisms were deemed unnecessary, mirroring Pfeffer and Salancik's (1978) RDT framework, where resource control diminishes the need for shared governance. Conversely, Hospital B featured a central committee that determined standardisation proposals. However, surgeons' limited participation in this committee highlighted the challenges of misaligned priorities and interests. In contrast, Hospital C exemplified the potential of collaborative committees, with surgeons playing an active role in guiding standardisation initiatives. Similarly, in Hospital D, the committee facilitated alignment between logisticians and surgeons, demonstrating the effectiveness of balanced power dynamics in driving IM practices.

Finally, the findings of this study also extend the theoretical foundations of RDT and Stakeholder Theory by incorporating contextual factors such as funding orientation and organisational traits as contractual arrangements. Whilst De Vries (2011) focused on resource dependence and interdependence, this research demonstrated how environmental constraints and stakeholder alignment mechanisms shape surgeons' behaviours within healthcare contexts. Public funding within the Colombian NHS imposed financial constraints on Hospitals B and D, constraining surgeons' power and fostering collaboration. Meanwhile, evidence-based clinical guidelines acted as stakeholder alignment mechanisms, swaying stakeholder behaviours toward organisational goals. These dynamics were particularly evident in Hospitals C and D, where clinical guidelines facilitated standardisation and improved IM practices.

One of the novel insights from this study is the role of clinical guidelines and their impact on stakeholder alignment. These guidelines, driven by professional norms and rigorous evidence, served as a unifying mechanism for surgeons and logisticians. Adopting these guidelines was particularly effective in hospitals with a higher proportion of hospital-based surgeons, as observed in Hospitals C and D. This finding aligns with Montgomery and Schneller's (2007) emphasis on the role of clinical arguments in driving SCM improvements.

The practical implications of this research are significant for optimising SCM practices in healthcare settings. Hospitals can develop tailored strategies to enhance collaboration and system performance by contextualising stakeholder roles within specific organisational and environmental frameworks. The findings underscore the importance of fostering inclusive governance structures like medical evaluation committees to bridge stakeholder interests and achieve alignment.

In summary, this study provides a comprehensive model that integrates individual, organisational, and environmental factors within the intricate landscape of healthcare IM practices. Expanding the theoretical frameworks of RDT and ST offers a nuanced understanding of how contextual factors shape SCM practices. This model challenges existing paradigms by emphasising the interplay of power, urgency, legitimacy, and contextual influences, providing a robust foundation for future research and practical advancements in healthcare SCM.

6.6 The De Vries' revised framework

This study builds on De Vries's (2011) framework by introducing two critical dimensions—organisational context and environmental context—that fundamentally reshape how stakeholder behaviour is understood within IM practices in healthcare. De Vries's original framework focused on resource dependency and interdependency, offering valuable insights into the influence of individual stakeholder attributes, such as power and resource control. However, it did not consider the systemic factors that shape stakeholder roles and behaviours. This research addresses that gap by demonstrating how organisational and environmental contexts dynamically influence surgeons' power, urgency, and legitimacy as stakeholders, providing a more comprehensive understanding of their role within supply chain management (SCM) systems.

The organisational context is a significant addition to the framework, encompassing structural factors such as the ratio of hospital-based physicians and contractual arrangements with surgeons. The study shows that a higher proportion of hospital-based physicians fosters greater alignment between stakeholder priorities and organisational goals, improving collaboration and IM performance, as proposed by Nyaga et al. (2015). This finding directly extends De Vries's framework by incorporating internal hospital dynamics as critical determinants of stakeholder behaviour. Furthermore, contractual arrangements are a novel factor influencing surgeons' sense of ownership and accountability. Surgeons with direct hospital contracts are more likely to align with institutional goals, whilst independent contractors often prioritise personal preferences, creating tension within IM systems. These organisational elements introduce a deeper layer of complexity to De Vries's original model, linking structural characteristics to stakeholder power dynamics and engagement.

The second significant advancement is the inclusion of environmental context, particularly the role of funding orientation. The study reveals how private and public funding models shape stakeholder dynamics and organisational priorities.

Surgeons exert significant power in private-funded hospitals, such as Hospital A, leveraging their control over critical resources to dominate IM practices. This observation aligns with Pfeffer and Salancik's (1978) RDT, which underscores the centrality of resource control in stakeholder influence. Conversely, public-funded hospitals like Hospitals B and D demonstrate constrained surgeon power due to financial restrictions imposed by public healthcare systems. These constraints foster stakeholder collaboration, aligning their efforts towards cost containment and operational efficiency. By highlighting these distinctions, the research challenges De Vries's implicit assumption of static stakeholder power and demonstrates how funding orientation shapes stakeholder roles and priorities.

What sets this revised framework apart is its ability to explain how hospitals prioritise quality-driven versus instrumental efficiency-driven goals based on their organisational and environmental contexts. De Vries's original model did not account for these contextual influences, treating stakeholder behaviours and system priorities relatively fixed. This study shows that the ratio of hospital-based physicians, contractual arrangements, and funding models collectively shape the balance between quality and efficiency objectives. For instance, hospitals with a high ratio of hospital-based physicians, such as Hospital C, prioritise quality goals through standardisation initiatives and evidence-based practices. Conversely, public-funded hospitals like Hospital B, operating under financial constraints, are driven by efficiency goals that emphasise cost control. These findings illustrate the context-dependent nature of stakeholder behaviours and organisational priorities, extending the applicability of De Vries's framework to diverse healthcare environments.

Additionally, this research introduces the critical role of governance mechanisms, such as medical or pharmacy evaluation committees, as alignment tools within the revised framework. De Vries's model did not consider the influence of such mechanisms in interceding stakeholder power and fostering collaboration. This study demonstrates that committees are pivotal in bridging stakeholder interests, facilitating standardisation, and reducing tensions in IM practices. For example,

Hospitals C and D committees act as platforms for collaborative decision-making, enhancing alignment between surgeons and logisticians. In contrast, the absence of such structures in Hospital A underscores the dominance of individual surgeons, highlighting the importance of inclusive governance in mitigating power imbalances.

In summary, the revised framework represents a significant evolution of De Vries's (2011) model by integrating organisational and environmental contexts into analysing stakeholder behaviours within healthcare SCM. Including these dimensions provides a richer understanding of how systemic factors shape power dynamics, stakeholder alignment, and organisational priorities. By addressing gaps in the original framework, this research offers a more comprehensive and actionable model for analysing and optimising IM practices in healthcare settings. The revised framework presented in Figure 6-1 advances theoretical discourse and provides practical insights for tailoring SCM strategies to specific organisational and environmental contexts, bridging the divide between academic theory and real-world application.

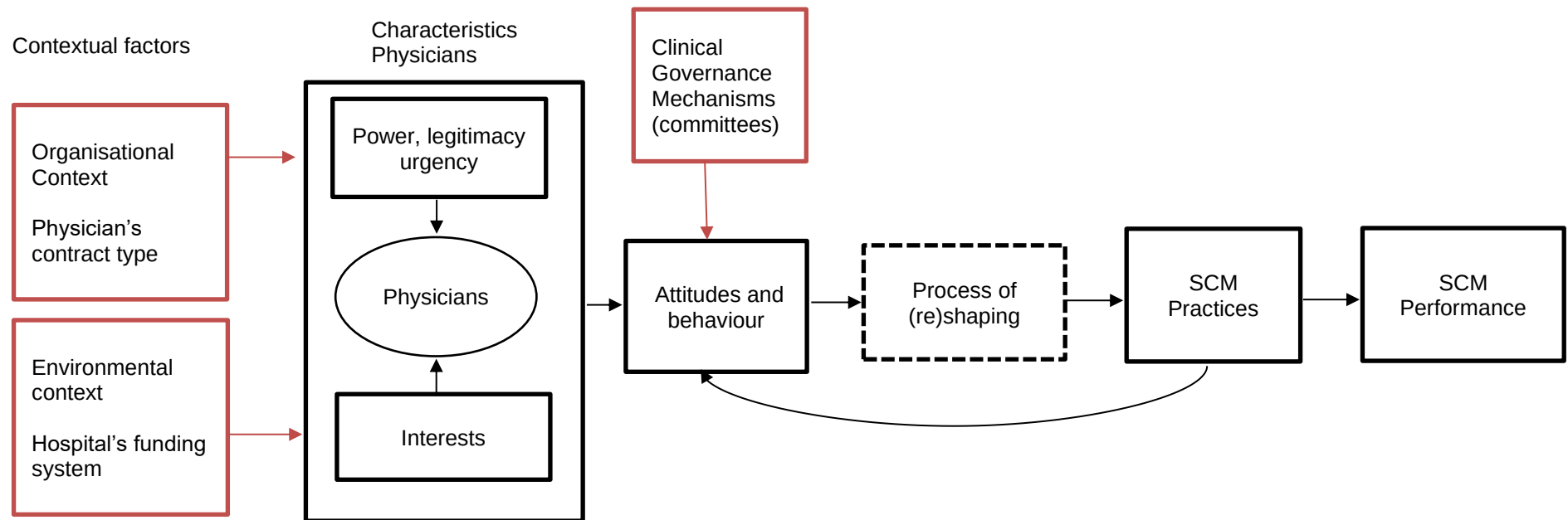


Figure 6-1 Revised Framework (De Vries, 2011)

Source: The author

7 CONTRIBUTIONS, CONCLUSIONS AND FURTHER RESEARCH

7.1 Theoretical Contributions

This thesis addresses two research questions (RQs) revising the De Vries (2011) framework. Firstly, it examines how the funding orientation of a hospital (private or public) influences surgeons' sway in the OT inventory system (RQ1). Secondly, it investigates how the hospital's contract arrangements with surgeons (hospital-based or non-hospital-based) impact their influence on the IM practices at the OTs (RQ2). These inquiries introduce two significant contextual elements. The first contextual element addresses RQ1 and is related to the environmental context of hospital funding (Aptel and Pourjalali, 2001; Budgett, Gopalakrishnan and Schneller, 2017; Issahaku et al., 2021; Lingg, Wyss and Durán-Arenas, 2016). The second contextual element addresses RQ2 and revolves around the organisational context, distinguishing between hospitals with a high proportion of hospital-based surgeons and those with a low proportion (Nyaga et al., 2015). These contextual elements expand the De Vries (2011) framework and enrich our understanding of the complex dynamics shaping HCSCM practices.

Moreover, RDT traditionally emphasizes the significance of external resources in shaping organisational power dynamics, yet its application often overlooks the nuanced and context-specific nature (Abernethy and Vagnoni, 2004). Based on the findings of this research, one recommendation to advance RDT is to incorporate a deeper understanding of resource specificity. In the HC sector, PPIs represent a unique resource that exerts disproportionate influence over inventory systems (Montgomery and Schneller, 2007). The strategic importance of these items amplifies the dependency of hospitals on surgeons, particularly in privately funded institutions with non-hospital-based physicians, as explored in this thesis. This specificity underscores the need for RDT to evolve by recognizing that not all resources are interchangeable or equally influential, and the power derived from resource control is contingent on its contextual value.

The findings also suggest that RDT could benefit from incorporating a stronger focus on intra-organisational resource dynamics. Traditional theory applications often concentrate on external resource dependencies, such as relationships between an organisation and its suppliers (Pfeffer, 1992). However, this research demonstrates that significant power dynamics also exist within organisations, as evidenced by the tension between clinical stakeholders and logistical teams in hospital settings. Surgeons' control over inventory-related decisions represents an internal dependency that directly impacts operational efficiency and cost management. By extending RDT to encompass intra-organisational power struggles, the theory could provide a more comprehensive view of how organisations manage external and internal resource dependencies.

Finally, RDT could incorporate mechanisms for mitigating dependency and redistributing power within organisations. The research findings suggest that strategies such as standardization of inventory practices (Cox et al., 2005; Montgomery and Schneller, 2007), adoption of evidence-based protocols (Freidson, 1999; Starr, 1982) and implementation of advanced technologies (Kritchanchai et al., 2018) can reduce the dependency of hospitals on specific stakeholders. RDT could evolve to provide actionable insights into how organisations can proactively manage and reduce resource dependencies to achieve greater operational autonomy and stability.

This thesis also contributes to advancing ST (Freeman, 1984) by proposing a revised application of the Mitchell et al. (1997) typology of stakeholder salience, specifically adapted for the healthcare sector. The original typology, which categorizes stakeholders based on their power, legitimacy, and urgency, is refined in this research to account for the unique dynamics in hospital environments, particularly in the context of IM systems. By incorporating contextual factors such as hospital funding orientation and the employment models of physicians, this revised framework provides a more nuanced understanding of stakeholder salience in healthcare supply chains.

The findings reveal that organisational structures and environmental conditions deeply influence stakeholder power in healthcare. For instance, surgeons in privately funded hospitals with non-hospital-based contracts are characterized by high levels of power and legitimacy due to their ability to influence hospital revenue streams and align with the institution's operational priorities. These stakeholders exhibit high salience under Mitchell et al.'s (1997) framework, with their urgency often arising from clinical preferences for physician preference items. However, this research shows that the manifestation of urgency is not solely a stakeholder-driven characteristic but is also shaped by environmental constraints, such as cost-management imperatives.

Conversely, in public hospitals with hospital-based physicians, the power of surgeons is diminished due to the centralized control of resources and the prioritization of cost containment over individual preferences. Here, surgeons retain legitimacy due to their professional expertise but exhibit lower influence because administrative and logistical structures moderate their influence. This shift demonstrates the fluidity of stakeholder salience and highlights the importance of contextual factors in determining stakeholder roles. This thesis extends its applicability by adapting Mitchell et al.'s (1997) framework to account for these dynamics, providing a more robust tool for analyzing stakeholder influence in complex, resource-constrained environments.

The revised typology also contributes to Stakeholder Theory by emphasizing the interplay between stakeholder attributes and the operational strategies of healthcare organisations. For example, the findings suggest that hospitals can actively reshape stakeholder salience through standardization initiatives and evidence-based protocols. These strategies reduce the power of individual stakeholders, such as surgeons demanding specific PPIs, and enhance the legitimacy of logistical and administrative priorities. This way, the revised framework moves beyond static classifications of stakeholder attributes to incorporate the dynamic interactions between stakeholders and organisational systems.

Furthermore, the revised typology offers practical insights for healthcare managers seeking to balance conflicting stakeholder interests. By identifying stakeholders with high power and urgency but limited alignment with organisational goals (dangerous stakeholders), managers can prioritize interventions that realign these stakeholders with broader institutional objectives. For example, engaging surgeons in collaborative decision-making processes whilst emphasizing inventory standardisation's financial and operational benefits can mitigate conflicts and enhance alignment. Similarly, the typology highlights the importance of empowering stakeholders with low power but high legitimacy (Cooperative Stakeholders), as surgeons in hospital D, to ensure that their expertise is effectively integrated into decision-making processes.

This contribution also underscores the broader theoretical implications for Stakeholder Theory in healthcare. By demonstrating how contextual factors mediate stakeholder salience, the research challenges the universality of Mitchell et al.'s (1997) framework and highlights the need for hospital context adaptations. In healthcare, where clinical autonomy, regulatory pressures, and resource constraints intersect, the traditional dimensions of power, legitimacy, and urgency must be reinterpreted to reflect these complexities. The revised typology proposed in this thesis (Section 6.5) addresses this gap, offering a more tailored approach to analyzing and managing stakeholder dynamics in hospital settings.

7.2 Empirical Evidence Contribution

The empirical evidence contribution of this thesis is novel in the context of Colombias' HCSCM, explicitly focusing on power dynamics in IM practices within OTs. Whilst there have been previous studies on the power dynamics of HCSCM in similar middle-income countries, like Colombia, they list the influence of physicians' power without providing an in-depth understanding of how they shape the HCSCM practices (Lingg, Wyss and Durán-Arenas, 2016; Mamédio and Meyer, 2020).

This research fills this gap by shedding light on how contextual factors like public and private funding significantly sway the power dynamics of surgeons involved in IM practices. To the author's knowledge, this is the first study in Colombia that examines how the coercive pressure of Colombian NHS regulations affects IM practices through the influence of surgeons in the OTs, particularly in public-funded hospitals. This research departs from the empirical evidence to a comprehensive approach, in contrast to previous works like Aptel and Pourjalali (2001) and Budgett, Gopalakrishnan, and Schneller (2017), which do not delve into the nuances of power dynamics,

Furthermore, the study explores the influence of contract arrangements, distinguishing between high and low hospital-based surgeons, and provides insights into how this organisational contextual element shapes surgeons' power dynamics over IM practices. Additionally, the study stands apart from works like Nyaga (2015), which was quantitative and focused on stewardship theory. Nyaga's work proposed that private-funded hospitals outperform public-funded ones but did not delve into the mechanisms behind this phenomenon. This research goes beyond Nyaga's study by exploring how surgeons' contract arrangements affect the power dynamics of IM practices. It also explains how and why this happens and through which mechanisms.

To the author's knowledge, this study marks an effort to examine power dynamics with active participation from these diverse stakeholders, encompassing logistics

experts, top-level executives (such as CEOs, CFOs, and CMOs), and influential surgeons. This inclusive approach resulted in data of exceptional richness and depth, making a substantial contribution to the comprehensive exploration of RQ1 and RQ2. Additionally, the distinctive feature of this study lies in its combination of varying hospital-funding contextual elements (public and private) and the organisational aspect of high and low hospital-based physicians, representing an innovative approach in the field.

The empirical findings validate the theoretical model and the stakeholder typology framework, aligning with and confirming the theory through the deductive research strategy employed in data collection. Furthermore, the research bridges the gap between environmental and organisational factors, offering empirical insights into how different contextual elements at different levels of analysis impact SCM practices through surgeons's power dynamics.

7.3 Context Contribution

The context contribution of this research is significantly enriched by its exploration of healthcare supply chain management (SCM) within the specific setting of Colombia, a middle-income country with its own unique National Health System (NHS) and healthcare dynamics (Bernal and Gutierrez, 2012). This distinctive focus provides a deeper understanding of SCM practices in a context that differs from the often-studied high-income Western healthcare systems (Ahmadi et al., 2017; Owusu Kwateng, Appiah and Atiemo, 2021), thereby broadening the scope and applicability of SCM research.

A crucial aspect of this research is its examination of how Colombia's NHS and the broader socioeconomic conditions of a middle-income country influence SCM practices in healthcare. This exploration is essential because the operational, financial, and regulatory environments in middle-income countries like Colombia can significantly differ from those in high-income countries (Bernal and Gutierrez, 2012; Kritchanchai, Hoeur and Engelseth, 2018). This research showed that differences between middle-income countries could impact resource allocation, stakeholder behaviours, and decision-making processes in SCM through the funding mechanisms derived from the structure of the NHS, in this case, the Colombian NHS.

One of the key context contributions is the study's insight into the implications of public funding within the Colombian NHS. In a system where resources are primarily controlled by the government and subjected to specific regulations and price control (ANDI, 2019; Bernal and Gutierrez, 2012), the dynamics of SCM can be noticeably different from those in private-funded systems. The research reveals how these public-funded pressures affect the power dynamics within hospitals, notably decreasing the power and influence of surgeons in IM practices, as was observed and found in Hospitals B and D.

Moreover, the empirical evidence from Colombian hospitals offers a unique perspective on the power dynamics between organisational contract

arrangements, surgeons and IM practices. These dynamics include exploring how professional norms, perceptions and attitudes towards clinical guidelines and medical standardizations impact IM practices. Such an exploration is critical for understanding the unique challenges and opportunities faced by hospitals in middle-income countries.

In conclusion, the context contribution of this research is significantly enhanced by its focus on Colombia's NHS and healthcare system. By exploring SCM in a middle-income country's specific socio-economic and regulatory context, the study provides valuable insights that extend beyond the often-studied high-income country contexts (Ahmadi et al., 2017; Owusu Kwateng, Appiah and Atiemo, 2021). This research enriches the academic discourse on healthcare SCM and offers practical implications for improving SCM practices in similar healthcare settings worldwide, particularly in middle-income countries.

7.4 Practical Contributions

The impact contribution of this research in the field of HCSCM lies in its practical insights and implications, which enhance the knowledge of SCM practices, particularly in the context of IM in OTs. This research offers valuable contributions that can directly influence and improve SCM practices in healthcare institutions by thoroughly examining surgeons' power dynamics within various organisational and environmental contexts.

One of the significant practical contributions of this research is its ability to inform and guide decision-making in healthcare SCM. Among the contributions is a deeper understanding of how private or public hospital funding orientation and organisational physicians' contract type can affect SCM practices. Healthcare managers and policy-makers can use these insights to develop more effective strategies for IM, resource allocation, and stakeholder engagement.

The research also has a notable impact on improving efficiency and effectiveness in healthcare IM. The study provides a roadmap for identifying and addressing challenges specific to various healthcare settings by uncovering the complex interplay of factors influencing IM practices in different hospital contexts. For instance, insights into how public and private funding models impact SCM can help hospitals optimize their IM strategies in alignment with their funding structures and constraints.

Furthermore, the study's findings on stakeholder dynamics, particularly the roles and influences of surgeons in IM practices, have significant implications for improving collaboration and communication within hospital SCM systems. Understanding these dynamics can lead to more effective stakeholder management strategies, enhancing the overall efficiency and effectiveness of SCM practices.

Another practical impact of this research is its contribution to standardization efforts in healthcare IM practices. Exploring how clinical guidelines, normative

pressures, and stakeholder interests influence SCM practices provides a valuable perspective for standardizing and reducing PPIs. This is particularly relevant for hospitals balancing clinical needs with operational efficiency.

The research also offers insights into adapting SCM practices in resource-constrained environments, as seen in the Colombian NHS. This particularly impacts healthcare institutions in countries where resource limitations present unique challenges. The findings can guide these institutions in developing innovative SCM strategies that maximize resource utilization and efficiency despite financial and infrastructural constraints.

Moreover, this research addresses a critical gap in understanding surgeons within the HCSCM domain. It goes beyond the conventional application of mathematical models in SCM. It explores other organisational theories that elucidate why achieving SCM and IS excellence can be challenging, even when HC institutions have the will and resources to implement SCM/IS practices. By selecting IM practices within the OTs as the unit of analysis, this research extends the boundaries of SCM knowledge in healthcare whilst complementing the field of project management.

The empirical findings resonate with a surgeon's assertion that "*inventory quality is correlated positively with the coherence of the medical practice.*" This coherence extends beyond physicians to encompass administrative and clinical staff, amplifying the significance of the healthcare industry's role. This dimension fosters a deeper understanding of how the healthcare industry plays a substantial role in shaping the normative aspects and influencing clinical practices. Furthermore, it underscores the intricate relationship between HC institutions and industry stakeholders, highlighting the importance of this collaboration in defining the coherence of medical practices.

Additionally, the study suggests a correlation between adherence to standard clinical guidelines and IM performance. Whilst not quantitatively demonstrated, the findings indicate that standardization can lead to improved outcomes. The role of physician commitment, reflected in clinician contracts, surfaces as a

potential catalyst for enhanced IM performance. However, this link warrants further quantitative exploration in subsequent research phases.

On the other hand, Surgeon commitment, facilitated by organisational arrangements, emerges as a driving force behind improved IM performance, reinforcing findings from prior studies (Nyaga et al., 2015). Additionally, the study underscores the role of IS in IM practices, which can harness data-driven decision-making and facilitate the transition towards standardization.

A third empirical contribution lies in uncovering how contextual factors moderate the scale of surgeons' influence on SCM practices. The research identifies four distinct contexts where the scale of influence varies based on hospital ownership (for-profit or non-profit) and the type of payers (private or National Health Service affiliates). It becomes evident that these contextual factors substantially impact the mechanisms at play within IM practices.

The physician's contract structure emerges as a critical factor in moderating influence. It is simpler to align surgeons with direct, exclusive contracts with an institution, whilst non-exclusive physicians operating in multiple hospitals face challenges in adhering to strict guidelines and data-driven processes. This context-driven variation in influence underscores the importance of considering contractual arrangements when assessing physician influence.

The following section explores the implications of this research, spanning across distinct domains, each benefiting from the insights and practical applications unveiled through this comprehensive study. This research offers valuable theoretical foundations and helpful utility that transcends the confines of academia, especially to C-level executives, physicians, and SCM staff.

7.4.1 Hospital practitioners

The findings presented in this thesis emphasize the critical contextual factors shaping inventory management practices in hospitals and offer several practical implications for stakeholders. These implications are tailored explicitly for practitioners such as heads of logistics, inventory management teams, and contracting physicians. These recommendations aim to address observed

challenges, foster efficient practices, and promote alignment with organisational and operational goals in diverse hospital contexts.

For heads of logistics, it is essential to recognize and adapt to the contextual dynamics highlighted in the research. In settings with a high prevalence of non-hospital-based physicians, logistical decision-making often faces significant external influence, particularly regarding inventory selection and replenishment cycles. To counteract this, heads of logistics should implement structured governance mechanisms that limit improvised changes to IM practices. These mechanisms could include formalized policies requiring that new item requests undergo cost-benefit analysis and align with hospital-wide inventory objectives before approval. Moreover, tailored communication strategies should be employed to engage non-hospital-based physicians effectively, ensuring their concerns are heard whilst maintaining operational integrity.

The variability in surgeon influence on inventory systems also necessitates strategic adjustments to IM practices. In contexts where physician influence is high, the head of logistics should leverage evidence-based approaches to negotiate standardization. This may involve presenting data on the operational and financial impacts of PPIS, such as increased stockholding costs, procurement inefficiencies, and elevated risks of stockouts. Logistics leaders can build a stronger case for standardization whilst respecting clinical priorities by integrating these data-driven insights into discussions with clinical stakeholders.

Advanced inventory technologies can also address context-specific challenges. Deploying integrated systems such as RFID or real-time tracking software can enhance visibility and accountability (Bendavid et al., 2010; Opolon, 2010), particularly in hospitals with decentralized decision-making structures. For example, in hospitals where non-hospital-based surgeons frequently operate, such technologies can provide logistical teams with detailed usage patterns, helping preempt unnecessary stockouts or overstocking.

IM teams should adopt strategies that align operational efficiency with the unique contextual factors outlined in this research. Collaborating with vendors through VMI systems offers a pragmatic approach in hospitals with private funding and

low hospital-based physician ratios. These systems allow suppliers to assume greater responsibility for stock monitoring and replenishment, reducing administrative burden and aligning replenishment schedules with actual consumption trends (Krichanchai and MacCarthy, 2017; Matopoulos and Michailidou, 2013). Additionally, implementing hybrid replenishment models, such as Kanban or dual-bin systems, can ensure critical items remain available without incurring unnecessary carrying costs (Rivard-Royer et al., 2002; Rosales et al., 2014; Rosales et al., 2015).

For contracting physicians, revising employment and procurement agreements is a crucial strategy to address the influence of contextual elements. For non-hospital-based physicians, contracts should explicitly delineate the scope of their decision-making authority regarding inventory items. Clauses limiting the ability to demand specific PPIs outside a pre-approved list could reduce the operational disruptions caused by individual preferences. Additionally, offering physicians transparent insights into their choices' financial and operational impacts could foster greater alignment between clinical and logistical priorities (Rosenstein 2004). For example, by presenting aggregated data on PPI-associated costs and usage trends, contracting teams can highlight the broader implications of inventory decisions and encourage collaboration.

Furthermore, educational initiatives tailored to physicians can further support aligning clinical preferences with organisational objectives. These programs should explain the logistical challenges associated with high inventory variability and the benefits of adopting standardized practices (Section 2.2). Hospital administrators can promote a more cooperative relationship with physicians by framing these educational efforts as opportunities for collaborative improvement rather than as restrictive measures.

Besides, the broader implications of these findings call for a systems-level approach to inventory management in hospitals. Hospitals should establish KPIs specific to contextual factors, such as inventory turnover rates, stock accuracy (Section 2.3), and PPI adoption rates, to monitor the efficacy of implemented

strategies. Regular performance reviews, incorporating input from logistical and clinical teams, can provide valuable feedback for refining policies and practices.

Finally, conflict resolution frameworks are another essential element of effective inventory management. Disagreements between logistical and clinical stakeholders are common in hospitals with diverse funding models or mixed employment structures for physicians. Establishing neutral mediation mechanisms, such as committees comprising representatives from both sides, can ensure that conflicts are resolved transparently and equitably. These committees should use data-driven analyses to evaluate competing priorities and propose evidence-based solutions.

In conclusion, the practical implications derived from this research highlight the importance of tailoring inventory management practices to the unique contextual dynamics of hospitals. Hospitals can enhance efficiency and reduce costs by fostering collaboration, leveraging advanced technologies, and aligning physician preferences with operational goals. These recommendations provide actionable pathways for practitioners to address the complexities of inventory management, ensuring that hospitals achieve clinical and logistical excellence.

7.4.2 Hospital Managers

This study's research findings have shed light on the distinctive dynamics of IM practices within different hospital contexts (Hospitals A, B, C, and D). Each of these hospitals operates within unique contextual settings, and their power dynamics concerning IM practices exhibit notable variations. This section presents recommendations individually for each hospital based on the observed power dynamics and contextual factors.

Hospital A (Private-funded and low hospital-based surgeons)

Hospital managers and supply chain professionals need to adopt a nuanced approach in Hospital A, where surgeons wield considerable power and significantly influence Inventory Management (IM) practices. The dynamics here involve surgeons categorized as dominant stakeholders, which presents unique challenges and opportunities in implementing effective SCM practices.

Introducing incentives for adoption is a critical strategy in this environment. Hospital A can benefit from offering tangible and intangible incentives to encourage surgeons to adopt new IM practices. Tangible incentives might include financial bonuses, access to advanced medical technology, and opportunities for professional development that align with their career goals. On the other hand, intangible incentives could involve recognition programs, awards for compliance with SCM practices, or positions on influential hospital committees. These incentives cover the surgeons' professional aspirations and intrinsic motivations like prestige and building reputation.

Balancing stakeholder interests is another crucial aspect of Hospital A. This balance of interests involves engaging surgeons in meaningful dialogue, where their concerns and suggestions regarding IM practices are heard and valued. Developing collaborative strategies that align the surgeons' interests with the hospital's is critical. For instance, demonstrating how efficient IM practices can lead to better patient outcomes, which in turn enhances the hospital's reputation and operational efficiency, could be a persuasive approach.

When implementing standardization initiatives, caution and strategic planning are paramount. Hospital A must involve surgeons in the standardization process, perhaps by forming a committee with surgeon representatives. This involvement will ensure that the proposed changes are practical and that the unique needs of their practice are considered. It is also crucial to address concerns about medical autonomy directly. Clear communication about the reasons behind standardization, supported by data or case studies from similar healthcare settings, can help alleviate fears and misconceptions.

Finally, customizing SCM solutions to meet the specific needs of Hospital A's surgeons can significantly facilitate the adoption of new practices. Tailoring SCM practices, such as customizing inventory lists or order procedures, can make these changes more palatable to surgeons who are used to a certain degree of autonomy and personalized working conditions.

By carefully implementing these strategies, Hospital A can navigate the complex dynamics of surgeon influence on SCM practices, creating a collaborative

environment where healthcare providers and patients benefit from improved and efficient healthcare delivery.

Hospital B (Public-funded and low hospital-based surgeons)

In Hospital B, a public-funded institution with a low number of hospital-based surgeons, the challenge lies in establishing legitimacy for new IM practices, particularly in a context where surgeons, categorized as demanding stakeholders, may resist changes to the established system. The recommendations for Hospital B managers involve navigating this complex terrain and ensuring that the implementation of SCM practices aligns with patient welfare and operational efficiency.

Since surgeons in Hospital B have low power and influence, acquiring legitimacy for IM practices becomes a central challenge. In this context, hospital managers and supply chain professionals need to focus on strategies that balance business logic with patient welfare. These strategies showcase how efficient SCM practices can improve patient care and the hospital's operational efficiency. Demonstrating these benefits is crucial to gaining surgeons' perceptions of the usefulness of the IM system.

Engaging with surgeons, who may have demanding expectations despite their low power, is essential. Effective engagement should aim to involve them in the process, giving them a voice in shaping the IM practices. This can be achieved through forums for open dialogue, such as regular meetings or feedback sessions where surgeons can share their concerns and suggestions. The objective is to create a participatory environment where surgeons feel their contributions are valued and heard.

Balancing business logic, cost control and efficiency in operations with patient welfare is a delicate act in Hospital B. Hospital managers need to navigate this balance, ensuring that the focus on operational efficiency does not overshadow the primary goal of patient care. Strategies should be directed at optimizing healthcare efficiency without compromising the quality of care provided to patients. Given surgeons' low power and influence in Hospital B, there is an

opportunity to introduce pilot projects to demonstrate the effectiveness of new SCM practices.

Furthermore, it is important to address any specific concerns of surgeons, particularly regarding how SCM or IM practices impact their daily routines. Solutions that are sensitive to these concerns and are designed to minimize disruption to clinical routines will likely be more effective. This might include flexible inventory systems or streamlined processes that reduce the administrative burden on surgeons and other clinical staff.

In conclusion, for Hospital B, the strategy should involve strategic stakeholder engagement, a focus on balancing efficiency with patient care, and a demonstration of the tangible benefits of the SCM initiatives. Hospital B can successfully implement SCM practices that align with efficient healthcare delivery and superior patient care, even when surgeons hold low power and influence, by employing a collaborative, inclusive, and evidence-based approach.

Hospital C (Private-funded and high hospital-based surgeons)

In Hospital C, a private-funded institution with a high number of hospital-based physicians, surgeons hold substantial power and are characterized as cooperative stakeholders with selective engagement. The environment in Hospital C presents an opportunity to leverage the existing power dynamics and issues of legitimacy for enhancing IM practices. The key lies in strategically aligning SCM practices with the interests and engagement levels of the surgeons.

The first step is to leverage the existing legitimacy of the surgeons for efficiency gains in IM practices. Given their significant influence, surgeons can be instrumental in facilitating portfolio reduction and enhancing the management of PPIs. This approach involves collaborating with surgeons to identify areas where SCM practices can be reorganized without compromising patient care. By involving them in decisions about PPI management, the hospital can ensure that changes are made with consideration for both clinical needs and operational efficiency.

Investing in SCM practices is another crucial strategy for Hospital C. The hospital's C-level executives need to recognize the importance of SCM practices and allocate the necessary resources to optimize these practices. This financial investment involves dedicating time and effort to develop and implement effective SCM strategies. The involvement of C-level executives can lend additional legitimacy to the SCM initiatives, making it easier to align these practices with the hospital's overall strategic goals.

Broadening stakeholder engagement is critical for Hospital C. Whilst surgeons are key players in the SCM system, involving a wider range of stakeholders can provide a more comprehensive perspective and lead to more effective implementation of IM practices. This broader engagement could include administrative staff, nursing teams, and other medical professionals. By incorporating diverse viewpoints and expertise, Hospital C can ensure that the SCM system is robust, adaptable, and responsive to the needs of all stakeholders.

In addition to these strategies, Hospital C should focus on selective engagement with surgeons. Since surgeons are cooperative but selectively engage with initiatives, especially those related to cost or efficiency improvements, it is important to frame these initiatives in a way that aligns with their interests and concerns. Demonstrating how SCM improvements can positively impact clinical outcomes, patient satisfaction, and even the professional satisfaction of the surgeons themselves can be an effective way to gain their support.

In conclusion, for Hospital C, the approach should centre on leveraging the legitimacy of surgeons, investing in SCM practices with C-level support, broadening stakeholder engagement, and focusing on selective engagement with surgeons. By aligning SCM practices with the interests and concerns of surgeons and other stakeholders, Hospital C can enhance its IM practices and achieve greater efficiency and effectiveness in healthcare delivery.

Hospital D (Public-funded and high hospital-based surgeons)

Hospital D, a public-funded institution with a high number of hospital-based physicians and low surgeon power, presents a unique environment for implementing SCM practices. The surgeons in this hospital are cooperative stakeholders, which provides an advantageous backdrop for enhancing IM practices.

Capitalizing on the alignment between low physician power and high legitimacy is a strategic approach for Hospital D. This unique combination offers a favourable context for the successful adoption and integration of SCM practices. The low power of surgeons implies fewer barriers to implementing new processes, whilst their high legitimacy ensures that any changes made will be taken seriously and respected within the hospital. Strategies should be developed to harness this alignment, promoting IM practices that benefit patient care and operational efficiency.

Investing in SCM initiatives is another essential recommendation for Hospital D. This involves financial investment and dedicating time and resources to develop and implement effective SCM strategies. Hospital managers should prioritize these practices, understanding that efficient SCM can significantly contribute to the overall functioning and success of the hospital. Active engagement with stakeholders, including surgeons, nursing staff, and administrative personnel, fosters a cooperative environment. This engagement can involve regular meetings, feedback sessions, and collaborative decision-making processes to ensure that all voices are heard and considered in the SCM implementation.

Continuing to align IM practices with the broader goals of the healthcare system is crucial. This alignment ensures that SCM initiatives are focused on operational efficiency and improving patient care. In Hospital D, aligning SCM practices with healthcare goals can further enhance the effectiveness of these initiatives, leading to better patient outcomes and more streamlined hospital operations.

In addition to these strategies, Hospital D should focus on leveraging the cooperative nature of its surgeons. Given their willingness to engage and low

power dynamics, it is an opportune moment to introduce innovative SCM practices that might require adjustments in existing workflows or routines. Engaging surgeons in designing and implementing these changes can ensure participation and cooperation and facilitate smoother transitions.

In conclusion, for Hospital D, the strategy should involve capitalizing on the unique combination of low surgeon power and high legitimacy, investing in SCM initiatives, and aligning these practices with healthcare goals. Hospital D can successfully implement SCM practices that enhance healthcare delivery and patient care by adopting a collaborative, transparent, and education-focused approach.

Conclusion

Each hospital (A, B, C, and D) faces distinct power dynamics and contextual factors influencing IM practices. Tailoring strategies to address these unique dynamics is crucial for successful SCM implementation and the efficient management of healthcare resources. By adopting the recommendations outlined above, hospital managers and supply chain professionals can navigate the complexities of surgeon influence in IM practices and work towards improved healthcare delivery and patient outcomes.

The implementation of Supply Chain Management (SCM) and Inventory Management (IM) "best practices" in healthcare settings presents significant challenges, influenced mainly by the unique dynamics and stakeholder power structures within individual hospitals. This aspect of the research holds profound implications and underscores a central theme of this thesis: the critical role of context in the successful application of SCM and IM practices.

In Hospital A, implementing SCM and IM best practices is particularly challenging. The powerful position of surgeons, who may perceive these practices as a threat to their autonomy, poses a potential risk for the failure of such initiatives. The dynamics here require a careful and strategic approach, where the perceived threats are mitigated, and the benefits of the practices are communicated and aligned with the interests of the surgeons.

Hospital B faces the challenge of engaging demanding stakeholders. The objective is to increase participation and buy-in from surgeons and other stakeholders. This can be achieved by demonstrating the tangible benefits of SCM and IM practices and ensuring these stakeholders perceive and utilize the system to improve performance.

Hospital C presents a contrasting scenario where a stewardship mindset prevails among surgeons. This environment is more conducive to adopting certain SCM practices, especially those directly aligned with patient wellness and benefits. However, other practices that do not directly align with these interests may encounter resistance or be more challenging to implement. The key in Hospital C is to strategically align SCM initiatives with the core values and interests of the surgeons.

Conversely, Hospital D offers a more favourable environment for implementing new IM practices. With cooperative surgeons with low power, the hospital presents an ideal case study for successfully integrating SCM best practices. The collaborative nature of stakeholders in Hospital D allows for smoother implementation and greater acceptance of new practices.

The central piece of this thesis is acknowledging that SCM and IM knowledge and best practices cannot be universally applied without considering the specific context of each healthcare institution. This realization is what makes this thesis particularly novel and practical. It emphasizes that the effectiveness of SCM and IM practices is heavily contingent on the unique environmental, organisational, and stakeholder dynamics of each hospital setting. Understanding and navigating these contexts is crucial for successfully implementing and optimising SCM and IM practices in healthcare. This thesis contributes significantly to the field by highlighting the need for a contextualized approach to SCM and IM, offering valuable insights for healthcare institutions seeking to enhance their operations and patient care services.

7.4.3 Practical Evidence 1: Novatecnica

Founded as part of the Amarey Group under the author's leadership, Novatecnica's inception and growth are linked to the insights gained from this thesis. The business model of outsourcing the IM system aligns perfectly with the identified opportunity – the underperformance of hospital IM systems compared to other sectors. This thesis facilitated the successful implementation of third-party IM systems for hospitals, focusing on information, planning, control, and physical systems, particularly emphasising organisational dynamics (De Vries, 2011).

Figure 7-1 Employment opportunities derived from the knowledge contribution

Source: Internal documents Amarey Group

By 2022, Novatecnica achieved remarkable feats in three years, amassing nearly 3 million pounds in revenues and creating employment opportunities for almost 130 individuals. The company's vision, centred around providing comprehensive solutions for consulting and managing complex healthcare IM practices, reflects a deep understanding of the intricacies and challenges in this domain. While studying this DBA, Novatecnica's success story began in 2020, marking intense growth and strategic development to revolutionise IM concepts in Colombia. This ambition positions Novatecnica as a business entity and a potential frontrunner in healthcare IM consulting across Latin America.

The unique value proposition of Novatecnica lies in its application of the theoretical model developed in this thesis. The model's practical implications in managing the power dynamics of physicians, including surgeons, form the cornerstone of Novatecnica's SCM solutions. This approach was first applied in a hospital context similar to Hospital D, characterized by lower physician power and a high number of hospital-based physicians, making it an ideal setting for adoption, as explained in section 7.5.2. The success here led to implementations in environments similar to Hospital B, where public funding and cost pressures provided leverage points for capturing the attention of key decision-makers like CFOs and CEOs, making standardization more viable.

Novatecnica's structure is crafted to serve specific customer profiles effectively, facilitating the adoption of SCM practices. The acceptance of this proposal by the board of Amarey Group, where the author was the CEO, rooted in the theoretical model and the research strategy of this thesis, led to the creation of a new business unit in 2019. With an initial focus on serving hospitals types C and D, Novatecnica has successfully implemented "best practices" (Christopher, 2016) in healthcare settings.

Looking ahead, Novatecnica has an ambitious business plan targeting revenues of 10 million pounds by 2025. The company is prepared for further expansion into Panama and Costa Rica, potentially creating over 200 jobs. This expansion is a business growth strategy and a commitment to reshaping Latin America's healthcare IM consulting landscape.

The impact of this research transcends the boundaries of healthcare. It offers a structured framework that is invaluable in any industry where socio-technical aspects are crucial in project implementation or shaping supply chain and information systems practices. This thesis enhances the effectiveness and efficiency of SCM and IS practices across various sectors by understanding and optimizing the complex interplay of human, organisational, and environmental factors, like in Novatecnica.

7.4.4 Practical Evidence 2: Vitalis Pharmaceuticals Holdings:

The implications of this research extend well beyond the confines of hospitals, offering valuable insights and practical applications for other supply chain links, as demonstrated in the case of Vitalis Pharmaceuticals Holdings. This application diversification underscores the versatility and adaptability of the SCM and IM best practices developed in this thesis, particularly when tailored to different organisational contexts.

Vitalis Pharmaceuticals Holdings, operating in the pharmaceutical industry in Latin America, serves as an exemplary case where the principles and strategies derived from this thesis were successfully applied. In this scenario, the company faced challenges similar to those encountered in healthcare settings, such as managing complex supply chains, aligning stakeholder interests, and optimizing inventory management practices.

The implementation at Vitalis involved a comprehensive analysis of the existing SCM and IM practices, followed by identifying and engaging key stakeholders. The key stakeholders' mapping included the chief commercial officer (CCO) and the chief financial officer (CFO), who played pivotal roles in the IM system. Utilizing the theoretical model from the thesis, the SCM Director at Vitalis led an initiative to map the power and interests of these stakeholders within the organisation, a move that proved to be transformative.

One of the significant observations was the contrasting perceptions of the IM system between the CCO and the CFO. Whilst the CCO viewed the system as underperforming, the CFO saw it as effective. This disparity highlighted the need for a strategic approach to align these differing perspectives. Regular meetings were initiated to analyze backorders, and decisions were made to restrict priority changes within a specific timeframe, emphasizing a more data-driven and systematic approach to inventory management.

In addressing the organisational context, Vitalis Pharmaceuticals realigned incentives to mirror the concept explored in the thesis, as proposed for case A in section 7.4.2. The performance metrics for inventory and sales were

incorporated into the financial compensation structures for the CCO and the CFO. This alignment of incentives played a crucial role in harmonizing the objectives of different stakeholders with the company's overall goals.

Furthermore, the environmental contextual factors were also considered, particularly Vitalis' role as a producer of generics for both private and public sectors. This understanding led to adaptations in SCM practices, including adjustments to the timeframe for priority changes, allowing for greater flexibility in response to market demands.

The outcomes of these initiatives were remarkable, with the company's fulfilment of KPIs with customers increasing significantly within a year of implementation. This success was not just the result of technical modelling but also due to the socio-technical skills of the Supply Chain Director and her team. The case of Vitalis Pharmaceuticals Holdings demonstrates the practical applicability and effectiveness of the SCM and IM models developed in this thesis, highlighting their potential for significant improvements in diverse industrial settings.

The Vitalis case is a testament to the broader applicability of the research findings, illustrating that effective SCM and IM principles are not confined to healthcare but can be adapted and applied successfully in other industries. This adaptability is particularly relevant in sectors where managing complex supply chains and aligning diverse stakeholder interests are critical for operational success. The case underscores the importance of a contextualized approach to SCM and IM, where understanding each organisation's unique dynamics and challenges is key to developing and implementing effective strategies.

7.4.5 Policymakers

The research conducted on HCSCM within the Colombian context presents a rich source of insights invaluable to policymakers, particularly those in the Colombian government. These insights are pivotal in shaping and refining healthcare policies, especially concerning SCM and IM practices, within a middle-income country like Colombia.

For policymakers, this research provides an understanding of the complexities inherent in SCM in the healthcare sector. It illuminates how different public and private funding orientations and organisational structures significantly impact SCM practices. This comprehension is vital for those designing efficient and effective healthcare systems to meet the population's needs. Implementing policies encouraging standardization in SCM practices could lead to more streamlined resource utilization, minimizing waste and enhancing patient care.

Moreover, the study emphasizes optimizing inventory by standardising clinical guidelines within the Colombian healthcare system. Policymakers can use these insights to devise strategies ensuring equitable access to medical supplies across different regions and institutions, a critical aspect in a country where healthcare resources might be unevenly distributed.

The research also highlights the significance of stakeholder engagement and collaboration in SCM. It advocates for policies that promote greater collaboration among various stakeholders in the healthcare system, including hospital administrators, medical staff, logisticians, and suppliers. Developing platforms for dialogue and cooperation or creating incentive structures that reward collaborative SCM efforts could effectively achieve this.

Adaptability to different environmental and organisational contexts is another crucial insight from the study. Policymakers should recognize and address various hospital settings' unique challenges and dynamics when formulating SCM policies. This might involve developing tailored policies for public and private hospitals or creating flexible guidelines adaptable to diverse institutional cultures and structures.

As highlighted by the research, the complexity of SCM in healthcare underscores the need for specialized knowledge and skills. Policymakers could focus on initiatives to enhance healthcare professionals' SCM competencies through educational programs, workshops, and seminars. Such initiatives are essential to ensure healthcare providers are well-equipped to manage SCM systems effectively and adapt to the evolving demands of healthcare delivery.

Lastly, the influence of national healthcare policies on SCM practices is a critical area in which this research can inform the Colombian government. By understanding how these policies manifest in the operational realities of healthcare institutions, policymakers can refine existing frameworks or introduce new ones more aligned with healthcare delivery needs and challenges. This alignment is crucial for healthcare systems' effective functioning and improving patient outcomes.

In conclusion, the research offers important insights for policymakers, particularly regarding the Colombian healthcare system. Considering this study's detailed findings and recommendations, policymakers can formulate more informed, context-specific, and impactful policies. These policies can potentially enhance the efficiency and effectiveness of healthcare delivery, contributing significantly to improved health outcomes in Colombia.

The case studies, Hospitals A to D, demonstrate varied scenarios, each requiring specific policy approaches. For instance, Case Study A (private funding and low hospital-based physician ratio) creates unique implementation challenges. In contrast, Case Study D, with a high ratio of hospital-based physicians and public funding, offers a favourable environment for smoother and more feasible implementation of new SCM systems and practices. These diverse scenarios highlight the need for policies that are not only contextually relevant but also responsive to the unique dynamics of each hospital-type context (A to D). Such tailored approaches are essential for successfully implementing and optimising SCM practices, leading to improved healthcare delivery and patient outcomes in Colombia and potentially influencing regional healthcare policy frameworks.

7.5 Conclusion

This doctoral thesis fundamentally addresses the issue of underperformance in Supply Chain Management (SCM) within the healthcare sector. Through a systematic literature review, the study identified the foundational theories, such as Resource Dependency Theory (RDT) and Stakeholder Theory (ST) of this thesis, which, in conjunction with the De Vries (2011) framework, formed the basis for a deductive theoretical model. This model was instrumental in shaping two critical research questions focusing on environmental factors, such as hospital funding orientation, and organisational factors, including contract arrangements with physicians.

This research explored and explained, using multiple case study methodology, how environmental and organisational factors influence the power dynamics of surgeons in inventory management practices. The study meticulously examined four distinct hospital contexts, providing rich empirical evidence that power and influence vary significantly across different settings, ranging from low to high.

The findings of this thesis have made significant contributions across several domains. Theoretically, the study expanded the understanding of how contextual factors within the healthcare environment influence SCM practices, particularly concerning surgeons' power in inventory management. Methodologically, using a case study approach allowed for an in-depth exploration of these dynamics, enhancing the robustness and validity of the research.

In terms of practical evidence, this research has provided valuable insights for healthcare institutions and has directly impacted the management practices of two companies. One of these companies, Novatecnica, emerged directly from this thesis, showcasing a profitable business model with a unique value proposition derived from the research findings. This underscores the practical applicability and real-world impact of the study.

The context contribution of this research is particularly notable in the Colombian healthcare sector, offering relevant and applicable insights into other similar settings. By examining SCM within the specific socio-economic and regulatory context of Colombia, a middle-income country, the study provides a deeper understanding of SCM practices that differ from those in high-income Western healthcare systems.

Furthermore, the practical contributions of this research are significant. The study provides a roadmap for healthcare institutions to identify and address challenges specific to their unique settings. It offers recommendations for improving efficiency and effectiveness in healthcare inventory management, standardizing practices, and adapting SCM strategies in resource-constrained environments. The insights into stakeholder dynamics and the roles and influences of surgeons in IM practices have significant implications for enhancing collaboration and communication within hospital SCM systems.

This doctoral thesis represents a meaningful advancement in the healthcare SCM domain. It bridges theoretical gaps, offers methodological innovation, provides rich empirical evidence, enhances understanding of the context, and delivers practical recommendations with real-world impact. The study's contributions extend beyond academia, influencing the practices and strategies of healthcare institutions and companies demonstrating the value of research in driving positive change in SCM practices, particularly in healthcare settings.

7.6 Limitations of Research

The limitations of this research are primarily associated with its qualitative case study approach, which, whilst offering depth and richness in data, poses challenges in the generalisation of the findings. This study is intended to provide a detailed understanding of the mechanisms influencing IM practices and surgeons' performance in OTs, explicitly focusing on four distinct case studies. The depth and specificity of these case studies, whilst providing valuable insights into the respective contexts, mean that the findings may not be readily applicable to or replicable in different settings, especially in developing countries where healthcare systems and operational dynamics may significantly differ from those observed in the developing world context of this research.

The study's focus on the developing world limits its applicability to other regions. The dynamics of surgeon influence on IM practices in the Colombian healthcare system, mainly influenced by public versus private funding orientation, might not directly correspond to the realities in developed countries with different healthcare systems and funding mechanisms.

Another limitation lies in the observed variation in the scale of power dynamics across the different hospital contexts. In private-funded hospitals (Hospitals A and C), surgeons exhibit a high level of influence, mainly due to the business logic of these hospitals, where patient choice and surgeon reputation play a significant role. This private-funded context contrasts with the dynamics in public-funded hospitals (Hospitals B and D), where the surgeons' influence decreases, reflecting different priorities, like cost and efficiency management, in the decision-making of the IM system. These contrasting dynamics highlight the contextual specificity of the findings, which may not be entirely applicable to all hospital settings and, therefore, needs to be adapted.

Moreover, the practical contribution of this study, whilst addressing the crucial issue of poor logistics performance in hospitals, is based on findings from a specific healthcare context. Therefore, the applicability of these insights to other

industries, such as pharmaceuticals or medical technology, would require careful consideration and adaptation of the contextual elements identified in this research.

In summary, whilst this research offers substantial contributions to understanding SCM in healthcare settings, particularly in the developing world context, its limitations stem from the qualitative case study approach and the specific healthcare system context it explores. These factors should be considered when applying the study's findings to different settings or industries, acknowledging the need for adaptation and further research to explore these dynamics in varied contexts.

7.7 Suggestions for further research

This section outlines various lines of further research that build upon the foundational insights presented in this doctoral thesis, exploring the realm of healthcare supply chain management (SCM) and its intricate dynamics. These prospective research directions aim to expand the existing understanding, address limitations, and apply the findings to broader contexts.

A critical area for future exploration involves the quantitative assessment of surgeon power dynamics within healthcare settings. The development of structured surveys and the application of quantitative scales would enable researchers to measure the extent of influence surgeons empirically exert in inventory management practices across diverse hospital environments. Such empirical data, offering a contrast to the qualitative depth of the current study, would provide a more comprehensive view of the power dynamics in various healthcare systems, thereby broadening the scope of understanding.

Integrating a mixed-methods approach would further enrich future research endeavours. By combining quantitative data, particularly Key Performance Indicators (KPIs), with qualitative insights, researchers can better understand the relationships between surgeon influence, SCM practices, and overall hospital performance. This holistic approach promises to deliver a more complete picture

of SCM dynamics within healthcare institutions, thus offering valuable insights for practitioners and policymakers.

Further research could examine diverse healthcare structures globally, especially in low-income and developed countries. Such studies would illuminate the global applicability and relevance of the findings from this thesis, highlighting unique challenges and opportunities in different healthcare systems. This expansion is crucial for developing a more universal understanding of SCM in healthcare.

Additionally, broadening the research to encompass other contextual elements beyond those previously studied would enable the adaptation and refinement of the theoretical models proposed in this thesis. Investigating various organisational structures, funding mechanisms, and cultural factors within healthcare settings could uncover new aspects of surgeon influence and SCM effectiveness.

Exploring other systems within healthcare, such as innovation management, along with different components of the supply chain beyond inventory management, represents another promising research trajectory. This would offer a comprehensive view of the interplay between organisational dynamics and various management systems, contributing to a deeper understanding of SCM in healthcare.

Moreover, including other professional stakeholders like general practitioners in SCM research could offer unique insights, particularly in understanding the influence of primary care on hospital inventory and SCM practices, or other specialized physicians like oncologists or radiologists with enormous power.

Building on the comprehensive analysis presented in this thesis, another intriguing line of future research involves examining the impact of individual characteristics, such as personality traits, on power dynamics within healthcare supply chain management. This area of study would delve into how the personal attributes of healthcare professionals, particularly surgeons, influence their ability to gain or wield power, even within established contextual frameworks.

This research direction recognizes that power dynamics in healthcare settings are not solely dictated by external factors such as organisational structure or funding models but are also significantly influenced by the individual characteristics of key stakeholders. Personality traits, leadership styles, interpersonal skills, and professional reputation could be crucial in determining the extent of influence a surgeon or healthcare professional holds. For instance, traits like assertiveness, charisma, and the ability to communicate and negotiate effectively could enhance a surgeon's influence, whilst traits like introversion or a less assertive communication style might diminish their power, regardless of the broader context.

Exploring these individual characteristics could provide insights into how power is gained, maintained, or diminished in healthcare environments. It would help to explain variations in power dynamics observed among professionals working under similar contextual circumstances. This line of research could involve psychological assessments, personality profiling, and in-depth interviews to understand the interplay between personal attributes and professional dynamics in healthcare SCM.

In conclusion, the lines of further research stemming from this thesis present significant opportunities to advance the field of healthcare SCM. Through quantitative assessments, a mixed-methods approach, global explorations, and broadening the focus to include various stakeholders and industries, future studies can build upon the groundwork laid by this thesis. These research endeavours promise to deepen academic knowledge and provide practical insights for enhancing operational efficiency and innovation across various healthcare contexts.

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APPENDICES

Appendix A Quality Appraisal

Appendix table 1 Quality appraisal framework

Criterion	1-Weak	2-Moderate	3-Strong
<i>Theoretical Background</i>	Poor awareness of existing literature and debates. The theoretical background is not clearly described.	Basic understanding of the issues around the topic being discussed. The theory is weakly related to data.	Deep knowledge of relevant literature. The theoretical background is clearly defined, and the research is positioned within existing literature.
<i>Methodology</i>	Flawed research design. Unreliable methodology or unclear description of methodology.	Research design may be improved. The methodology is transparently described, but there are minor discrepancies.	The research design is robust. It is a clearly defined methodology, logical and rigorous.
<i>Findings</i>	Poor linkage between findings and contributions. Vague relationship among findings, methodology and data.	There is a linkage between the contribution, findings and methodology with minor discrepancies.	Findings are grounded in the data and the methodology used. Contributions are stated based on findings.
<i>Contribution</i>	The study adds little to the body of knowledge in this area.	The study builds upon the existing theory and provides an adequate contribution to knowledge.	A significant addition to current knowledge. Expanding the way that the issue has been explained so far.
<i>Implication for Practice</i>	It is very complicated to implement the ideas and concepts presented. It is not relevant for practitioners or professionals.	There is a potential for implementing the proposed ideas with minor revisions or adjustments.	Significant benefits may be obtained if the discussed ideas are implemented.

Source: Adapted from Pittaway et al. (2004) by the author.

Appendix B Quality Appraisal Heuristic for inclusion and exclusion

The quality appraisal comes from a matrix of 5 criteria in which each criterion was given a punctuation of 0 to 3; therefore, the maximum was 15. The quality appraisal passed the articles that punctuated above 9. Punctuations below nine were removed, and the three articles are presented above in Appendix Table 2. These articles were ranked as low importance. The following table shows the importance ranking (first column) and possible combinations for the different punctuations from 5 to 15.

Appendix Table 2 Quality Appraisal punctuation

Importance	Quality appraisal score	Number of articles in the process	Number of criteria in weak (1)	Number in moderate (2)	Number in strong (3)	Number of articles
Low	5	0	5	0	0	0
Low	6	1	4	1	0	1
Low	7	1	3	2	0	1
Low	7	1	4	0	1	0
Low / Medium	8	4	2	3	0	4
Low / Medium	8	4	3	1	1	0
Medium	9	2	1	4	0	2
Medium	9	2	2	2	1	0
Medium	9	2	3	0	2	0
Medium	10	27	0	5	0	26
Medium	10	27	1	3	1	1
Medium	10	27	2	1	2	0
Medium	11	13	0	4	1	10
Medium	11	13	1	2	2	3
Medium	11	13	2	0	3	0
Medium / High	12	11	0	3	2	11
High	13	10	0	2	3	10
High	13	10	1	0	4	0
High	14	12	0	1	4	12
High	15	3	0	0	5	3

Source. The author

Appendix C Inclusions in the SLR from cross-reference articles

Appendix Table 3 Cross-reference articles

THEORY	Article	Journal	Theoretical background	Methodology	Findings	Contributions	Implications for practice	TOTAL
Other	(Aptel and Pourjalali, 2001)	The International Journal of Accounting	2	2	3	2	3	12
ST	(Aravazhi et al., 2020)	Engineering Management in Production and Services	2	2	2	2	2	10
Other	(Bhakoo, Singh and Sohal, 2012)	Supply Chain Management: An International Journal	2	2	2	2	2	10
ST	(Burns et al., 2007)	Journal of Surgical Research	2	2	2	2	2	10
RDT	(Chasseigne et al., 2018)	International Journal of Surgery	2	2	2	2	2	10
IT	(Furukawa et al., 2008)	Health Affairs	2	2	2	2	2	10
RDT	(Koyle et al., 2018)	Journal of Pediatric Urology	2	2	2	2	2	10
RDT	(Montgomery and Schneller, 2007)	Milbank Quarterly	3	3	3	3	2	14
TRA	(Walter Lopez, 2008)	Decision Support Systems	2	3	3	3	3	14

Source: The author

Appendix D Articles that missed the quality appraisal

Appendix Table 4 Articles not included in the Literature Review due to quality appraisal.

THEORY	Article	Theoretical background	Methodology	Findings	Contributions	Implications for practice	TOTAL
TRA	(Vargas-Herrera, Meneses and Cortez-Escalante, 2022)	1	2	1	1	1	6
RDT	(Hinterplattner and Staberhofer, 2016)	2	1	1	2	1	7

Source: The author

Appendix E Articles studied in the literature review

Appendix Table 5. Quality appraisal of the Short-listed articles included in the Systematic Literature Review (Chapter 2)

THEORY	Article	Theoretical background	Methodology	Findings	Contributions	Implications for practice	TOTAL
RDT	(Abernethy and Vagnoni, 2004)	2	3	3	3	2	13
IT	(Ahmadi et al., 2017)	3	3	2	2	2	12
RDT	(Ahmadi et al., 2018)	2	3	3	2	2	12
ST	(Alkrajji, Jackson and Murray, 2016)	2	3	2	2	2	11
TRA	(Almarzouqi, Aburayya and Salloum, 2022)	2	3	2	3	3	13
Contextual factors	(Alzaabi et al., 2023)	2	2	2	2	3	11
Contextual factors	(Aptel and Pourjalali, 2001)	2	2	3	2	3	12
ST	(Aravazhi et al., 2020)	2	2	2	2	2	10
Other	(Askfors and Fornstedt, 2018)	2	3	3	3	2	13
IT	(Beaulieu and Lehoux, 2018)	3	3	3	3	3	15
Contextual factors	(Bhakoo, Singh and Sohal, 2011)	2	2	2	2	2	10
IT	(Bialas et al., 2023)	2	3	2	2	2	11
Contextual factors	(Bjørn et al., 2009)	3	2	2	2	2	11
RDT	(Boonstra, Boddy and Bell, 2008)	3	2	3	3	3	14
ST	(Boonstra, van Offenbeek and Vos, 2017)	2	3	2	2	2	11
Contextual factors	(Budgett, Gopalakrishnan and Schneller, 2017)	2	2	2	3	2	11
ST	(Burns et al., 2007)	2	2	2	2	2	10

THEORY	Article	Theoretical background	Methodology	Findings	Contributions	Implications for practice	TOTAL
Contextual factors	(Callen, Braithwaite and Westbrook, 2007)	2	2	2	2	2	10
Other	(Cao, Jones and Sheng, 2014)	2	2	2	2	2	10
Other	(Chang et al., 2007)	2	2	2	2	2	10
Medical	(Chasseigne et al., 2018)	2	2	2	2	2	10
TRA	(Chau and Jen-Hwa Hu, 2002)	2	3	3	2	2	12
IT	(Chen and Bennett, 2013)	2	2	2	2	2	10
RDT	(Coombs, Knights and Willmott, 1992)	3	3	3	3	2	14
RDT	(Cox, Chicksand and Ireland, 2005)	3	3	3	3	3	15
Other	(Cucciniello et al., 2015)	2	3	3	2	1	11
Other	(Currie and Brown, 1997)	2	3	3	2	1	11
ST	(Currie, Burgess and Hayton, 2015)	3	3	2	2	2	12
RDT	(D'Aunno et al., 2018)	2	2	2	2	2	10
ST	(Derecho et al., 2024)	2	2	2	2	2	10
RDT	(Doolin, 2004)	3	3	3	3	2	14
Contextual factors	(Furukawa et al., 2008)	2	2	2	2	2	10
IT	(Gopalakrishna-Remani, Jones and Camp, 2019)	2	2	2	2	2	10
RDT	(Hellström, Lifvergren and Quist, 2010)	2	3	2	2	2	11
TRA	(Hossain, Quaresma and Rahman, 2019)	2	3	2	2	2	11
TRA	(Hu et al., 1999)	3	3	3	3	2	14
TRA	(Huang et al., 2016)	2	2	2	2	2	10
Other	(Hussain and Cornelius, 2009)	3	3	3	3	2	14
RDT	(Islamoglu and Liebenau, 2007)	3	2	2	3	2	12
Contextual factors	(Issahaku et al., 2021)	2	3	2	3	2	12

THEORY	Article	Theoretical background	Methodology	Findings	Contributions	Implications for practice	TOTAL
ST	(Jahangirian et al., 2015)	2	2	2	2	2	10
TRA	(Jensen and Aanestad, 2007)	3	3	3	2	3	14
IT	(Jensen, Kjærgaard and Svejvig, 2009)	3	3	3	2	2	13
IT	(Jones and Wooldridge, 2016)	2	2	2	2	2	10
IT	(Klecun et al., 2019)	3	3	2	3	2	13
Medical	(Koyle et al., 2018)	2	2	2	2	2	10
RDT	(Kumar et al., 2022)	2	3	3	3	2	13
ST	(Langabeer et al., 2009)	2	2	2	2	2	10
ST	(Lawrie et al., 2022)	2	2	2	2	2	10
Contextual factors	(Lingg, Wyss and Durán-Arenas, 2016)	2	3	2	3	2	12
TRA	(Liu and Cheng, 2016)	2	2	2	2	2	10
TRA	(Lu et al., 2020)	3	3	2	3	2	13
TRA	(Luo et al., 2024)	3	3	2	2	2	12
RDT	(Lux and Petit, 2016)	3	3	2	3	2	13
ST	(Madhlambudzi and Papanagnou, 2019)	3	2	2	2	2	11
Other	(Mamédio and Meyer, 2020)	2	3	2	3	2	12
ST	(Matopoulos and Michailidou, 2013)	3	3	2	2	3	13
Other	(McInnes et al., 2021)	1	2	2	2	1	8
RDT	(Montgomery and Schneller, 2007)	3	3	3	3	2	14
ST	(Mustafee et al., 2013)	2	2	2	2	2	10
Contextual factors	(Nyaga, Young and Zepeda, 2015)	3	3	3	3	3	15
RDT	(Olson, Obremskey and Bozic, 2013)	2	2	2	2	2	10
TRA	(Owusu Kwateng, Appiah and Atiemo, 2021)	2	2	2	2	2	10

THEORY	Article	Theoretical background	Methodology	Findings	Contributions	Implications for practice	TOTAL
Other	(Papadopoulos and Merali, 2009)	3	3	2	2	1	11
TRA	(Paré, Sicotte and Jacques, 2006)	2	2	2	3	2	11
ST	(Peltokorpi et al., 2008)	2	2	1	2	1	8
ST	(Pouloudi, 1999)	2	2	2	2	2	10
Other	(Rappold et al., 2011)	2	2	2	2	2	10
ST	(Rosenstein, 2004)	1	1	2	2	2	8
Other	(Schlichter and Rose, 2013)	3	3	3	3	2	14
ST	(Schlieter et al., 2022)	1	2	2	2	2	9
ST	(Serrano et al., 2020)	2	3	2	2	2	11
IT	(Shahzad et al., 2021)	2	2	2	2	2	10
Other	(Shaw et al., 2011)	2	2	2	1	1	8
TRA	(Sheng et al., 1998)	2	3	2	2	1	10
RDT	(Shrivastava et al., 2023)	2	2	2	2	2	10
ST	(Stockert and Langerman, 2014)	2	2	2	2	2	10
RDT	(Sulz et al., 2022)	3	3	3	2	2	13
RDT	(Sun, 2021)	2	3	3	3	2	13
RDT	(Tong, Tan and Teo, 2017)	3	3	2	2	2	12
TRA	(Tsiknakis and Kouroubali, 2009)	2	3	3	2	2	12
RDT	(Vann Yaroson et al., 2023)	2	3	3	2	2	12
ST	(Verleye et al., 2017)	3	3	3	3	2	14
RDT	(De Vries, 2011)	2	3	3	3	3	14
ST	(Walley, 2013)	3	3	3	3	2	14
TRA	(Walter Lopez, 2008)	2	3	3	3	3	14

THEORY	Article	Theoretical background	Methodology	Findings	Contributions	Implications for practice	TOTAL
ST	(Yang et al., 2015)	2	2	2	2	2	10
Contextual factors	(Zhu et al., 2022)	2	2	2	2	1	9

Source: The author

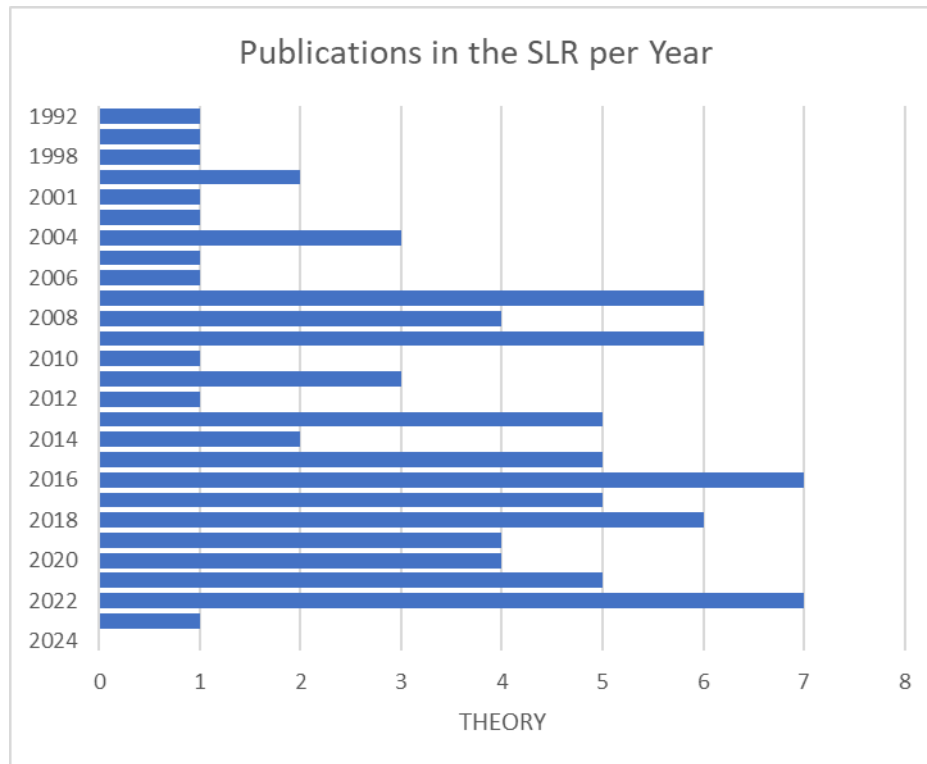
Appendix F Literature Review Descriptive

Appendix Table 6 Articles according to journals

Journal	Articles	Average Score
Information & Management	5	11
European Journal of Information Systems	3	13
Journal of Information Technology	3	13
Information Systems Journal	2	14
International Journal of Managing Projects in Business	2	13
Decision Support Systems	2	12
PLoS ONE	2	12
Supply Chain Management: An International Journal	2	11
International Journal of Healthcare Technology and Management	2	11
BMC Medical Informatics and Decision Making	2	11
Journal of Enterprise Information Management	2	11
International Journal of Information Management	2	11
Information Systems Frontiers	2	11
International Journal of Healthcare Management	2	10
Journal of Medical Internet Research	2	9
Journal of Public Procurement	1	15
Journal of Innovation and Entrepreneurship	1	15
Journal of Business Logistics	1	15
Info Systems Journal	1	14
Journal of Management Information Systems	1	14
Information Systems Management	1	14
Journal of Service Management	1	14
Milbank Quarterly	1	14
Organization Studies	1	14
International Journal of Production Economics	1	14
International Journal of Environmental Research and Public Health	1	13
International Journal of Logistics Systems and Management	1	13
Public Organization Review	1	13
Scandinavian Journal of Management	1	13
Accounting, Organizations and Society	1	13
Healthcare (Switzerland)	1	13
Computers in Human Behavior	1	12
Information Systems Research	1	12
Technological Forecasting and Social Change	1	12

Humanities and Social Sciences Communications	1	12
Health Research Policy and Systems	1	12
Human Resource Management	1	12
International Journal of Medical Informatics	1	12
The International Journal of Accounting	1	12
Journal of the American Medical Informatics Association (JAMIA)	1	11
Journal of Manufacturing Technology Management	1	11
Project Management Journal	1	11
BMC Health Services Research	1	11
Health Systems	1	11
Public Money and Management	1	11
Sustainability (Switzerland)	1	11
Digital Policy, Regulation and Governance	1	11
Clinical Orthopaedics and Related Research	1	10
Operations Management Research	1	10
Transforming Government: People, Process and Policy	1	10
In Digital Health	1	10
Journal of Organizational Computing and Electronic Commerce	1	10
Journal of Surgical Research	1	10
Journal of the Operational Research Society	1	10
International Journal of Computers and Applications	1	10
JOURNAL OF MANAGERIAL ISSUES	1	10
Engineering Management in Production and Services	1	10
Journal of Pediatric Urology	1	10
Health Affairs	1	10
Journal of the American College of Surgeons	1	10
Social Science & Medicine	1	10
Health Services Research	1	10
Supply Chain Forum: International Journal	1	10
International Journal of Surgery	1	10
Physician Executive	1	8
International Journal of Health Care Quality Assurance	1	8
Australian Health Review	1	8
Journal of the Association for Information Systems	1	8

Source: The author



Appendix Figure 1 Publication per year

Source: The author

Appendix G Data Extraction format

Appendix Table 7 Data format used in the literature review

Article: <i>Sorted by author's last name (A-Z)</i>	
Authors:	
Journal:	
Year of publication:	
Primary author region: (Developed country / Developing Country)	
Source: EBSCO() ABI () Cross-reference ()	
Average Score:	
Questions to ask	Description
a. Why am I reading this article?	Did the article come from the systematic literature review?
b. What are the authors trying to do in writing this?	Research Question of the authors and aim of the research
c. What are the authors saying that is relevant to what I want to find out?	Does the article answer the Review question?
d. How convincing is what the authors are saying?	How was the research design? Was it an empirical, qualitative, quantitative or conceptual paper? How was the data collected?
e. In conclusion, what use can I make of this?	Am I using the article to explain something? What findings from the report are going to be used? Am I going to build from this work? Do I pretend to use it for my research design?

Source. Adapted by the author from (Wallace Mike and Wray Alison, 2006)

Appendix H Data Extraction Examples

This appendix section presents ten examples of high-scoring articles for the SLR.

Appendix Table 8 Data extraction Example 1 – (Beaulieu and Lehoux, 2018)

Article: Emerging health technology firms' strategies and their impact on economic and Healthcare system actors: a qualitative study
Authors: (Beaulieu and Lehoux, 2018)
Journal: Journal of Innovation and Entrepreneurship
Year of publication: 2018
Primary research region: Canada
Source: EBSCO() ABI (X) Cross-reference ()
Score: 15/15
Why am I reading this article?
It came from the SLR. It introduces the influence of physicians on the PPI.
What are the authors trying to do in writing this?
How do HC actors adopt new PPIs, and how can the IT lenses be explained?
What are the authors saying that is relevant to what I want to find out?
<p>Pressures from financial and regulatory bodies (NHS and Health Canada in this case), health professionals and shareholders</p> <p>Isomorphism as a pressure. In the case of hospitals B or D, where there are firm regulations like the visits to physicians from the industry that are now forbidden. So, there is a new set of rules and new practices.</p> <p>Some actors due to the complexity of the technology of the products. It is challenging to interact and have acute information.</p> <p>In isomorphism, the role of key opinion leaders that the industry looks for has built their reputation among experience, exposure and clinical reputation. Their recommendations tend to be followed due to isomorphism. At the same time, the KOLs are legitimate advisors to the medical community. This can be explored in the research about the interests of surgeons.</p> <p>Due to the complex process of gathering information about a product, the guidelines become how the world moves. Therefore, clinical guidelines are important in this research.</p> <p>The NHS (Canada) acquisition process could hinder the adoption of new medical devices or PPI. This could be explored when researching public-funded cases.</p> <p>Healthcare improvement and transaction costs are important to explore in public funding cases. The burden of this is often manifested in tight budgets. This creates pressure. The new expenses sometimes cannot be covered by NHS, and private patients come into play for exploring privately funded hospitals.</p>

<p>The industry and how it finds access to new technology are important to explore in the research.</p> <p>So, information to measure the effectiveness of new technology is important, and this delays the adoption. This creates a more favourable environment, which should be found in public funding hospitals. (Discuss this)</p> <p>This research is about NHS in Canada, but other healthcare systems like Colombia could complement this research.</p> <p>A complex bureaucratic hierarchy. Agenda and different interests among stakeholders.</p> <p>Socially constructed concepts: Legitimacy and Reputation building.</p>
How convincing is what the authors are saying?
They have used IT to explain 20 semi-structured interviews.
In conclusion, what use can I make of this?
<p>This could be used for the Institutional theory lens to understand power dynamics. This paper could be used for discussion about the role of key opinion leaders, the burden of costs of NHS that delay access to technology, and how this could impact the SCM / IS management practices. It is also important for ideas in the coding process of the interests of surgeons and their agenda in their reputation building.</p> <p>This article could be used to explain why PPIs are so complex and challenging to have equivalence.</p>

Source: The author

Appendix Table 9 Data extraction Example 2 (Cox, Chicksand and Ireland, 2005)

Article: Overcoming demand management problems: The scope for improving reactive and proactive supply management in the UK health
Authors: (Cox, Chicksand and Ireland, 2005)
Journal: Journal of Public Procurement
Year of publication: 2005
Primary research region: UK
Source: EBSCO(X) ABI () Cross-reference ()
Score: 15/15
Why am I reading this article?
It came from the SLR. It introduces the influence of physicians on the PPI in the UK NHS.
What are the authors trying to do in writing this?
Three cases and a case study methodology show that SCM and sourcing practices failed to address the misalignment of supply and demand in the NHS (UK). Demand management problems: product over-specification, the premature establishment of design and specification, frequent changes in specification, poor demand information, fragmentation of spend, maverick buying, inter-departmental power, and politics are the causes of poor SCM performance. These demand problems affect the sourcing strategy and demand selection.
What are the authors saying that is relevant to what I want to find out?
Suppose 15-20% in cost reduction in the NHS without compromising quality or functionality —for example, footwear and hip replacement. Nineteen companies in the UK manufactured sixty different hip prostheses. Product over spec. Surgeon and sales reps' relationship. Premature establishment of spec. Surgeon role and buyers. Fragmented change, 19 suppliers and resistance to change by physicians, switching costs theory. In inter-departmental power, surgeons maximize functionality whilst procurement minimizes costs—opportunistic behaviour.
How convincing is what the authors are saying?
They have used RDT to explain by studying 2 cases in the NHS: Footwear and hip prostheses.
In conclusion, what use can I make of this?
Over-specification by the surgeon . Frequent changes in specification by internal customers (physicians). Fragment of spending: surgeons have their preferences (PPI) favourite supplier. Inter-departmental power and politics, what are their alliances (logisticians, not mentioned but due to power dynamics? According to the physician's power, it could be an enemy or ally; the other is understanding the sourcing process determining an essential enemy or critical ally.

Source: The author

Appendix Table 10 Data extraction Example 3 (Nyaga, Young and Zepeda, 2015)

Article: An Analysis of the Effects of Intra- and Interorganisational Arrangements on Hospital Supply Chain Efficiency
Authors: (Nyaga, Young and Zepeda, 2015)
Journal: Journal of Business Logistics
Year of publication: 2015
Primary research region: USA
Source: EBSCO() ABI (X) Cross-reference ()
Score: 15/15
Why am I reading this article?
From the SLR, it is a contextual factor in the physician's employment and contract management.
What are the authors trying to do in writing this?
SC definitions, Schneller (book). According to Montgomery and Schneller, the influence of PPI is up to 61%. Their decisions are not made on cost but on personal experience from a particular product, specific patient's interest, and relationship with manufacturing representatives. This comes in chapter 4. Physicians play an important role in the purchasing process. Decisions from physicians are made on expertise. (Power literature means power and legitimacy.) The SCM chapter. The standardization of IM practices and acquisition of supplies. Tucker 2003 for HC complexity and standardization came from Nyaga. Physicians may be competing with a hospital (surgical facilities) and could not be embedded in the hospital where they are in terms of their career, objectives, incomes or professional status.
What are the authors saying that is relevant to what I want to find out?
Hospital-based physicians. Figure 1 Conceptual model
How convincing is what the authors are saying?
Agency, stewardship theory. Eisenhardt 1989. Monitor or incentives to align. Davis 1997. Stewardship is regulated through self-control due to ownership and responsibility. The alignment of the interests of the agent and the principal could benefit the welfare of others. They used quantitative data from 1400 hospitals in California.
In conclusion, what use can I make of this?
The physician has a power advantage. Agency theory, agent (physician) agency hospitals. H1: The higher the proportion of hospital-based physicians, the greater the hospital's supply chain efficiency. 29% of operating expenditures are SC costs. Medical supplies are 60% of SC costs. Hospitals with more full-time physicians have higher SC efficiency (costs). Intraorganisational. Arrangements. Alignments of goals and ownership. Physicians and nurses may not be interested in aligning with supply chain goals. The trend toward employing direct physicians

Source: The author

Appendix Table 11 Data extraction Example 4 (Boonstra, Boddy and Bell, 2008)

Article: Stakeholder management in IOS projects: Analysis of an attempt to implement an electronic patient file
Authors: (Boonstra, Boddy and Bell, 2008)
Journal: European Journal of Information Systems
Year of publication: 2008
Primary research region: Netherlands
Source: EBSCO() ABI (X) Cross-reference ()
Score: 14/15
Why am I reading this article?
From the SLR, it appears it is related to the model of De Vries 2011
What are the authors trying to do in writing this?
Study the implementation of an inter-organisational system project, identify the power sources of the stakeholders and reconcile the stakeholders' interests.
What are the authors saying that is relevant to what I want to find out?
<p>Context. Outer: Social politics in the environment. Inner. Structure, culture. Historical, past events</p> <p>Stakeholders' interests, power and attitudes. Context outer: health priorities, fragmented HC system. Context inner: working practices power culture and finance. Implementation process, project perceived usefulness. Outcomes: embedded, normalised,</p> <p>Power interest grid Eddens , Ackerman 1998. Sources of power. Coercive: authority to give instructions. Reward: Authority to reward desirable behaviour. Administrative expertise. Technical expertise (physicians)</p> <p>Those with high interest in the system have low power, whilst those with low interest in it have the power to block it.</p> <p>The project was a failure.</p> <p>It brings the stakeholder definitions from ST (Freeman)</p>
How convincing is what the authors are saying?
A case study with 19 semi-structure interviews
In conclusion, what use can I make of this?
<p>Use it in Chapter 5 for the cross-case analysis of positive and negative attitudes toward IM practices. Also, include a matrix of power and interests.</p> <p>The project is not technical but organisational—a normalisation model embedded in the routine.</p> <p>It was done in the Netherlands; what about other contexts? Figure 1 explains the context, inner and outer, but not how the context affects and how different contexts sway the power dynamics. It seems it lacks this explanatory power in the paper.</p>

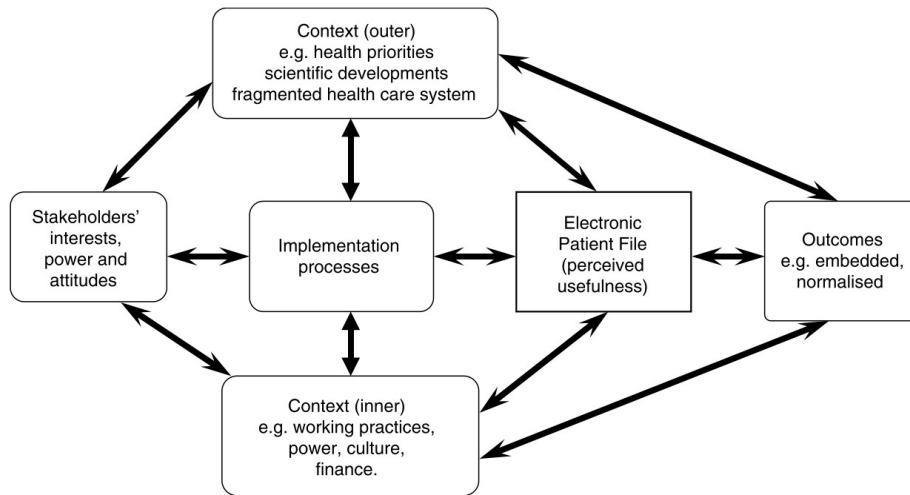


Figure 1 Summarizes our discussion in a stakeholder model of IOS implementation.

Source: Boonstra, Boddy and Bell (2008)

Source: The author

Appendix Table 12 Data extraction Example 5 (Coombs, Knights and Willmott, 1992)

Article: Culture, Control and Competition; Towards a Conceptual Framework for the Study of Information Technology in Organisations
Authors: (Coombs, Knights and Willmott, 1992)
Journal: Organisation Studies
Year of publication: 1992
Primary research region: UK
Source: SLR (X) Cross-reference ()
Score: 14/15
Why am I reading this article?
It is about the influence of ICT (Information Communications and Technology) in medical practice, with a case study on the NHS.
What are the authors trying to do in writing this?
Explain how ICT influences managerial and technical issues and organisational culture.
What are the authors saying that is relevant to what I want to find out?
Introduction of a project about the costs and volume of physicians in the NHS. And the possible use of this information. How do we align medical practices with managerial practices? They propose a framework for culture, control, and competitiveness. Under this framework, control of information, putting physicians and subunits to compete, could change physicians' behaviour.
How convincing is what the authors are saying?
A case study in the NHS (UK) and not mentioned directly, but RDT:
In conclusion, what use can I make of this?
Legitimacy of physicians, clinical freedom, accountability of costs? Different interests. A system like the IM could control physicians and put them in competition with information systems, changing the culture. This could be taken in the discussion chapter about how hospitals B and D, where there is the type of context of the NHS described here, could make them behave differently. Furthermore, it may be helpful to discuss the framing of SCM practices and how SCM practices could be used to change culture according to the framework of culture, competitiveness, and control. In this case, the intervention target, physicians, could react, creating a different outcome. It is interesting to see if there are reactions in case hospitals B and D.

Source: The author

Appendix Table 13 Data extraction Example 6 (De Vries, 2011)

Article: The shaping of inventory systems in health services: A stakeholder analysis
Authors: De Vries, 2011)
Journal: International Journal of Production Economics
Year of publication: 2011
Primary research region: Netherlands
Source: SLR () Cross-reference ()
Score: 14/15
Why am I reading this article?
Dr Nicky Yates, the lead supervisor of this thesis, recommended it. It came during the exploration of the positioning of this thesis. I like the theme.
What are the authors trying to do in writing this?
De Vries explains how the stakeholders influence the outcomes of an IM project (IS of the IM). He is trying to explain how the framing of the inventory system of pharmacies occurs in the Netherlands.
What are the authors saying that is relevant to what I want to find out?
Inventory systems are multidimensional systems. There is an influence in the shaping or reshaping of the inventory system. Hospitals are complex in terms of SCM. Lack of Inventory is critical, and a correct balance between SCM and Medical metrics is difficult to obtain. Physicians have power and legitimacy. The project was hardly implemented, and the results were not satisfactory.
How convincing is what the authors are saying?
He used a case study with 35 semi-structured interviews and applied the RDT. Additional four mini cases were developed.
In conclusion, what use can I make of this?
De Vries explained how the stakeholders influence with the lenses of the RDT. However, different contexts like other countries are different from the Netherlands, or if power dynamics, dimensions and interests are affected by context, it is not explored. De Vries talks about perceptions but not with the TRA. I could use this to extend the body of knowledge about it. De Vries (2005) describes the sub-elements of the inventory system: Physical, planning and control, information, and organisational system. This could be mentioned for the coding process, but citing De Vries 2005. It is attractive to discuss that power is not exerted only by stakeholders but by a coalition of stakeholders, and it is interesting to see how this is done in other contexts. For example, in the context of the cases, the pharmacy and financial committees had power, but it would be interesting to show that in other contexts, the power changes. This strengthens the argument about the context's sway on power dynamics.

This context was where physicians did not care about the project and was a federated-type meritocracy hospital. De Vries mentions that there is something known as a hospital setting. The context is in my research, but it does not explain how this influence is just that there is an element. He cites Mintzberg's Power in and Around Organisations. Please read it.

The starting point of the research model that complements Boonstra, Boddy and Bell (2008).

J. de Vries / Int. J. Production Economics 133 (2011) 60–69

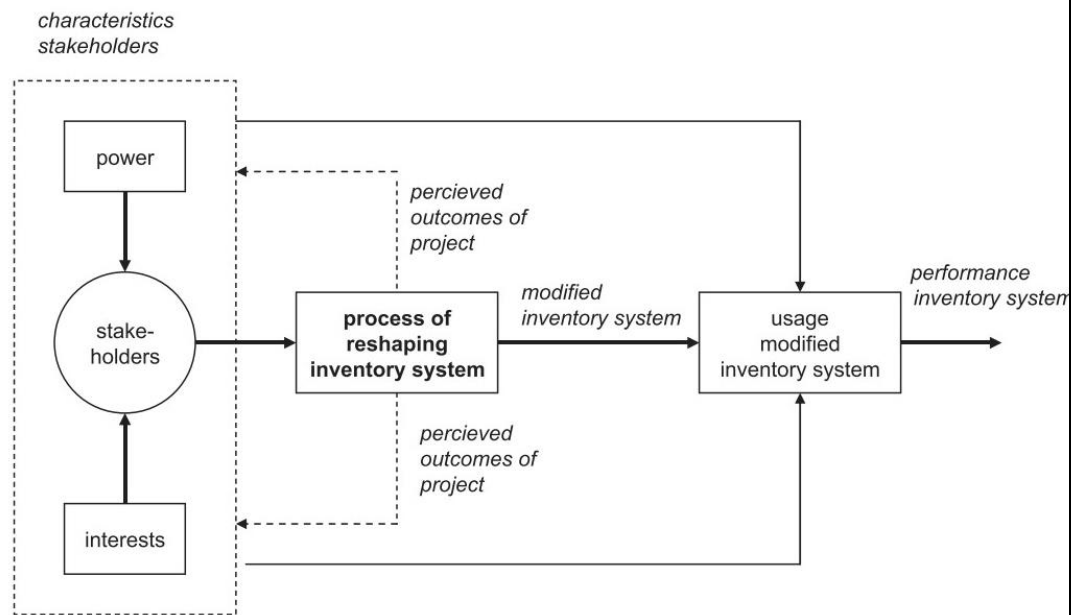


Fig. 1. Research model.

Source: De Vries (2011)

Source: The author

Appendix Table 14 Data extraction Example 7 (Doolin, 2004)

Article: Power and resistance in the implementation of a medical management information system
Authors: (Doolin, 2004)
Journal: Info Systems Journal
Year of publication: 2004
Primary research region: New Zealand
Source: SLR (x) Cross-reference ()
Score: 14/15
Why am I reading this article?
SLR and for exploring other power perspectives.
What are the authors trying to do in writing this?
Using the definition of power by Foucauld, explain the resistance of physicians to an HIS:
What are the authors saying that is relevant to what I want to find out?
Power is not possessed but is a capacity for action that resides in social relations. It exists when it is exercised (Foucault 1977). The context is a public-funded hospital. Doctors do not like to be monitored—reluctance to use tools from management. Clinical work was standardized. Management sees average. Difficult to standardize. A threat to the autonomy of their medical profession. The legitimacy interest: "If patients need treatment, they need them".
How convincing is what the authors are saying?
Case Study uses Foucault's power definition, not RDT.
In conclusion, what use can I make of this?
To complement power definitions of Chapter 2 according to Foucault's (1977) concept. The case mix IS was used for contract management and not to monitor clinical practice. Physicians challenged the system; they are not passive. For discussion, It can be said that IM perceptions by physicians jeopardize their medical profession. If so, do the perceptions change in the different contexts? Surgeons' perception of standardization, they see them as a threat to their professional autonomy. This is for discussion, and in the case of D, what happens? The ERP was dominated by financial and costing perspectives, a threat to autonomy, and I could discuss this. Doctors resisted in this case, using their power. This is the notion of Foucauld. It could be interesting to explore case B under this lens, where they exert power by resisting.

Source: The author

Appendix Table 15 Data extraction Example 8 (Hu et al., 1999)

Article: Examining the Technology Acceptance Model Using Physician Acceptance of Telemedicine Technology
Authors: (Hu et al., 1999)
Journal: Journal of Management Information Systems
Year of publication: 1999
Primary research region: Hong Kong
Source: SLR () Cross-reference ()
Score: 14/15
Why am I reading this article?
The article is about physicians' perceptions but is explained from the perspective of the TRA.
What are the authors trying to do in writing this?
They are trying to apply TAM to healthcare, where users are professionals.
What are the authors saying that is relevant to what I want to find out?
Attitude and intention. Perceived Ease of use (no significant effect), Perceived usefulness (important), attitude, intention to use Acceptance is defined in the article as a psychological state about his or her voluntary or intended use of a particular technology.
How convincing is what the authors are saying?
They use the lenses of TRA. They used surveys to determine the model's variables and then did a quantitative analysis in Hong Kong.
In conclusion, what use can I make of this?
Perceived usefulness is important to attitude to TAM. Perceived ease of use was not, and it is probably caused by the fact that physicians' learning attitudes of physicians are different to other users in which TAM was initially developed. TAM explanatory power in this study was low compared to what TAM in regular users (non-professional users) predicted $R^2 = .37$ for attitude and 0.44 for intention. The study suggests that other factors (different in ease of use and perceived usefulness) should be added to the model. Like power dynamics, discuss this in chapter 6. Furthermore, how do other contexts affect the TAM application? Could I propose this in the discussion? I could mention perceptions of IM to demonstrate when they find them useful and when not.

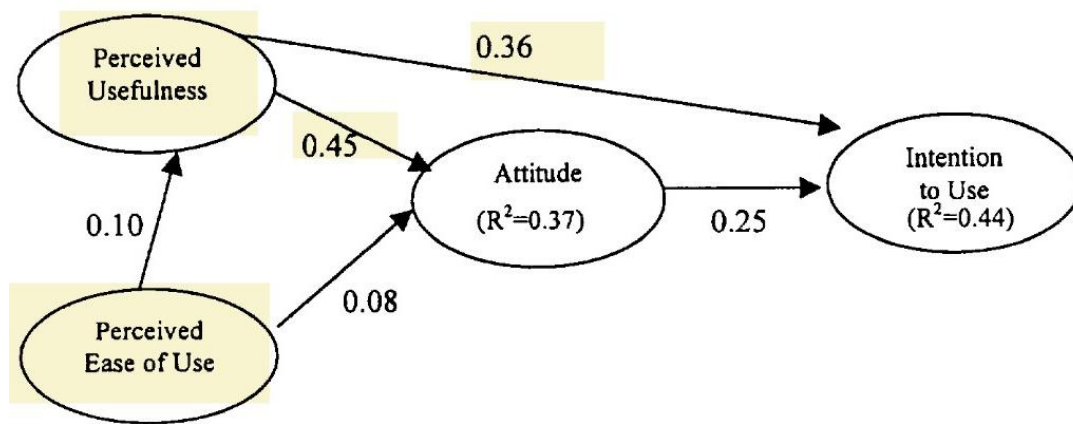


Figure 2. Model Testing Results

Source: Hu et al. (1999)

Source: The author

Appendix Table 16 Data extraction Example 9 (Schlichter and Rose, 2013)

Article: Trust dynamics in large system implementation: Six theoretical propositions
Authors: (Schlichter and Rose, 2013)
Journal: European Journal of Information Systems
Year of publication: 2013
Primary research region: Faroe Islands (Denmark)
Source: SLR (x) Cross-reference ()
Score: 14/15
Why am I reading this article?
From the SLR, trust concept and Gideons theory (structuration theory)
What are the authors trying to do in writing this?
<p>The structuration theory phases.</p> <p>Trust: The ability to have confidence even though the trusted person or social system is out of direct contact. The attribution of probity to a person or social system to act reliably concerning contingent outcomes and situations with incomplete knowledge. Re-embedding is necessary, is not fixed and is dynamic.</p>
What are the authors saying that is relevant to what I want to find out?
<p>Trust from structuration theory from Giddens. 6 theoretical formulations. 1. A disembedded project, supported by high levels of trust, is practical: A high level of trust is social capital. 2. Trust in the project is maintained through positive interactions at its access point; these reinforce the actor's ontological security. 3. When trust is low or turns into mistrust, ontological security is weakened. Overheads are introduced, and the project abstract is less dis-embedded and less effective. 4. Re-embedding activities can restore face-to-face trust. 5. The information system being implemented is a critical access point where re-embedding takes place. 6. the relationship between trust and outcomes is reciprocal and emergent.</p>
How convincing is what the authors are saying?
Case study, 50 semi-structured interviews, clarity about the coding process. They are using structuration theory.
In conclusion, what use can I make of this?
<p>IM system is abstract: dis-embedded social system trusted despite the lack of detailed understanding or personal trust relationship. IM is poorly understood by physicians, as discussed in Chapter 4. This I could test it. I will not use structuration theory. I am interested in IM practices at a specific date, meaning that each case study will not be explored as project implementation in which trust could come and go but rather as an exploration of the context and its sway in power dynamics. This research is not about trust dynamics and will not use these lenses.</p>

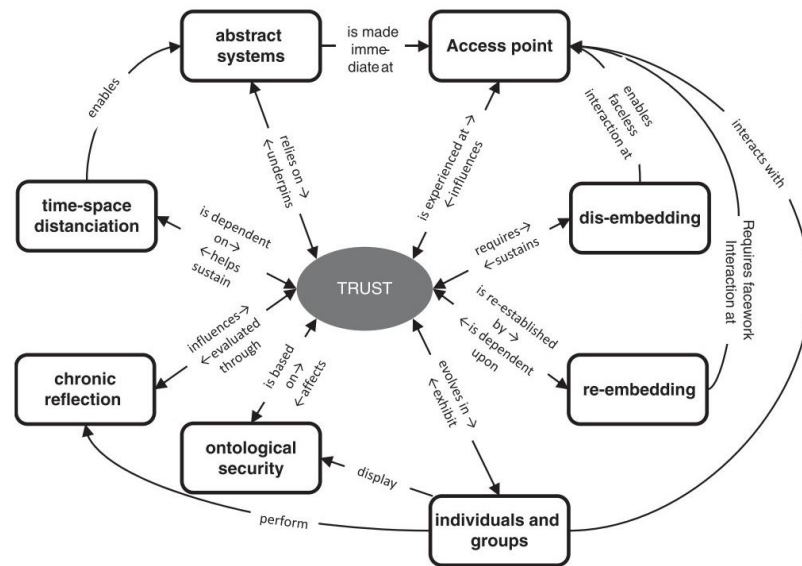


Figure 1 Construct relationships in Giddens' account of trust in abstract systems.

Source: Schlichter and Rose, 2013

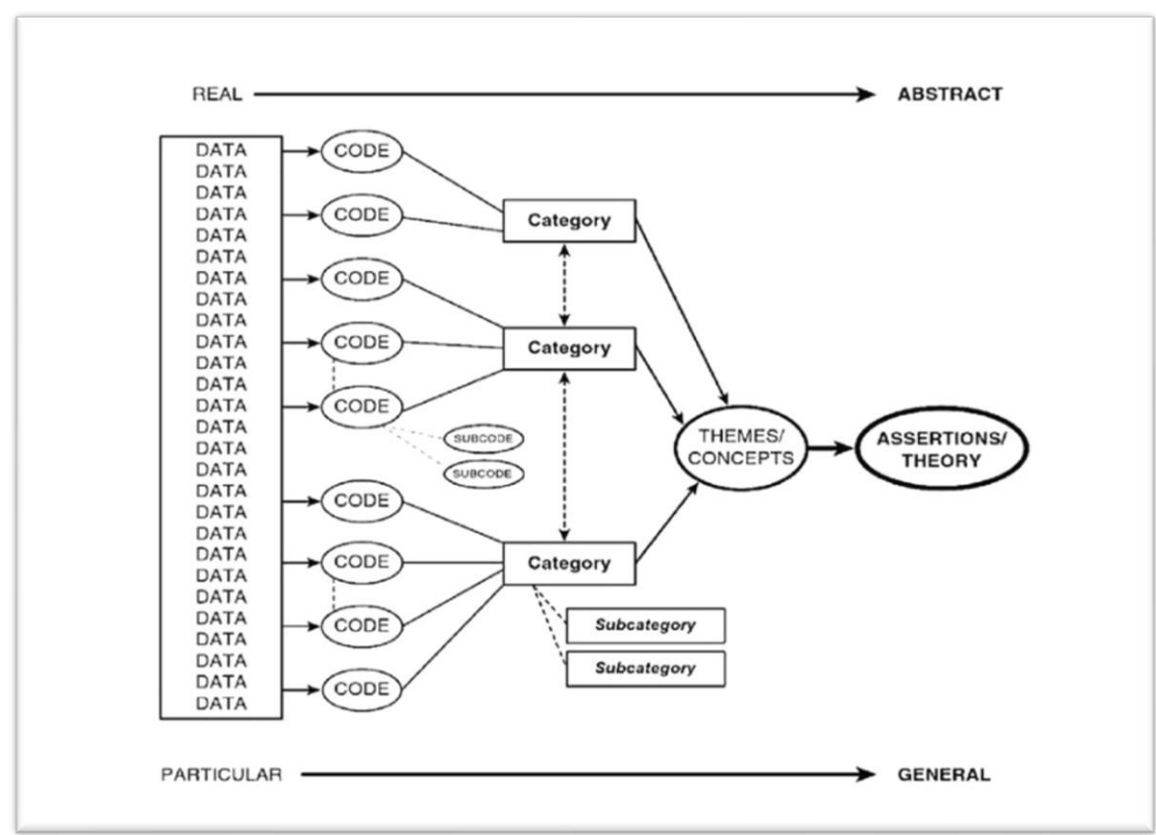
Source: The author

Appendix Table 17 Data extraction Example 10 (Montgomery and Schneller, 2007)

Article: Hospitals' strategies for orchestrating selection of physician preference items
Authors: (Montgomery and Schneller, 2007)
Journal: Milbank Quarterly
Year of publication: 2007
Primary research region: USA
Source: SLR () Cross-reference (x)
Score: 14/15
Why am I reading this article?
Cross-reference from SLR. I am interested in the concept of PPI and its management.
What are the authors trying to do in writing this?
In both models for standardization, the formulary model (top-down) and the payment-cap model, the challenge is to compare product equivalences. The payment-cap model preserves the physician's choice.
What are the authors saying that is relevant to what I want to find out?
Orchestrate, rather than dictate, the importance of medical autonomy. Standardization, how to do it and mechanisms to encourage cooperation. Prices of PPI vary from 2000 to 9000, and defining equivalent products is difficult. The formulary model restricts product, whereas the cap model restricts payment. Doctors do not want someone to dictate what to use, and it is insulting—the importance of data evidence-based medicine.
How convincing is what the authors are saying?
They used an RDT—case Study with 25 semi-structured interviews in 4 hospitals.
In conclusion, what use can I make of this?
How hospital-based physicians' context could be more accessible to orchestrate a cap model for standardization purposes. This article could be used to determine why PPI inventory is the unit of analysis . About RDT. Physicians control hospital admissions, the flow of money, and decisions about HC treatments and PPI. Suppliers or distributors control the knowledge and training, give on-site technical assistance, give research opportunities, and sometimes remunerate for science studies and development. Hospitals control the human resources, access to facilities, OT, and purchasing process. Patients, sometimes the physicians' choices (important to mention this part in Colombia, only private control that). Moreover, this could explain from the RDT lens why, in private funding contexts, the patients decide the institution according to the physician. Therefore, if physicians control the flow of patients in this context, they have power. This could be done in the findings chapter as a mechanism, like De Vries figures. Also, Tangible and intangible benefits for physicians that cooperate. It is interesting to see if there is something about this topic in my interviews. The regulation about incentives? This could come with the article of Canada (Beaulieu and Lehoux, 2018). Please read Schneller and Smeltzer 2006, book

Source: The author

Appendix I From codes and categories to theory



Appendix Figure 2 From data to codes and categories

Source: Reproduced from Saldaña (2016, p. 14)

Appendix J Research Strategy

According to Blaikie, the study can adopt four research strategies: deductive, inductive, retroductive, and abductive, and a brief description is presented in the following table.

Appendix Table 18. The four research strategies

	Inductive	Deductive	Retroductive	Abductive
Aim:	To establish universal generalizations to be used as pattern explanations	To test theories, eliminate false ones and corroborate the survivor	To discover underlying mechanisms to explain observed regularities	To describe and understand social life in terms of social actors' motives and understanding
Start:	Accumulative observations of data	Identify a regularity to be explained.	Document and model a regularity	Discover everyday lay concepts, meanings and motives.
	Produce generalizations	Construct a theory and deduce hypotheses	Construct a hypothetical model of a mechanism	Produce a technical account from lay accounts
Finish:	Use the "laws" as patterns to explain further observations	Test the hypotheses by matching them with data	Find the real mechanism by observation and or experiment	Develop a theory and test it iteratively

Source: Reproduced from (Blaikie, 2007).

This work adopted a deductive research strategy.

Appendix K Questionnaire type 1. C-level.

The author briefly introduced a small presentation, ethical approval, and recording authorization in this part of the interview.

- *Tell me about your hospital.*

Explore complexity, size, the number of beds, wards and ownership.

- *How do you measure the success of your hospital?*

Explore if Inventory Management pops up.

- *What are your main challenges?*

Explore the needs and pains of the hospital. The author did not include this question in the Pilot. ***He decided to include it because he wanted a trigger for the needs and pains in inventory, especially in terms of culture, market, etc.***

- *What is your definition of inventory and its purpose?*

Explore the knowledge of IM concepts.

How do you measure your Inventory Management performance? Is there any benchmarking for this IM performance? How is your ranking there?

Explore the KPIs for IM performance. Is it quality, time, finances, or productivity?

- *Who is responsible for the IM performance?*

Explore if it is a C-level priority and the structure of the IM department.

- *How do you manage the Inventory of the Wards or operating theatres?
How is it different from the IM of the Pharmacy and sub-pharmacy?*

Explore the differences in the IM in the operating theatres

The author did not include this question in the Pilot. The pilot's answers were about general inventory management, not the OT's inventory.

Sterilization, instruments, and trays may come up in this question. According to what the literature reported, it is good to explore if there is something new.

- *What are your KPIs for Inventory Management performance in the wards?*

Explore if there is something new with what the literature reports. ***The author did not include this question in the Pilot. He decided to have it because of focusing on the OT and not general inventory.***

- *Who is responsible for defining what to stock in the operating theatres?*

Explore the influence of the physicians and the scrub nurses in the IM practice. (De Vries, 2011), (Cox, Chicksand and Ireland, 2005), (Montgomery and Schneller, 2007). ***This question was not included in the Pilot and was proposed to better understand the KPIs and IM performance. This could lead to the mechanisms sought.***

- *How do you control this Inventory? What is the accuracy of your inventory?*

Explore if there are thefts due to the type of hospital. Explore the IM practices found in the literature. Explore if there comes something NEW.

- *How much is the value or ratio to sales of the Operating theatres' inventory inaccuracies? Is it a different ratio than the Pharmacy's Inventory or the main warehouse inventory inaccuracies?*

Explore if there are thefts due to the type of hospital. Explore if there comes something NEW.

- *Tell me about your replenishment inventory model. What is the practice behind it? How do you manage the replenishment of the operating theatre's inventory?*

Explore the IM practices found in the literature

Explore if there comes something NEW.

- *What are your main challenges in terms of Inventory Management at the wards?*

Explore the barriers to IM practices implementation.

This question allows for dealing with the influence of the stakeholders.

- *From 1 to 10, with 1 being the worst practice and 10 the best, what score would you suggest that your hospital is for these KPIs?*

Explore the logistics maturity perception.

Moreover, what is the score that your clinicians would suggest?

Explore and contrast answers.

- *Are there any pain clinicians manifesting about the IM practice in the wards?*

Explore the possible tension between clinical practice and supply chain practice. (Cox, Chicksand and Ireland, 2005), (De Vries, 2011), (De Vries, 2013), (Montgomery and Schneller, 2007), (Nyaga, Young and Zepeda, 2015), (Rosenstein, 2004)

- *How do you deal with them? What is the hospital's reaction to those pains?*

(De Vries, 2011), (Rosenstein, 2004). ***This question was not included in the pilot, and respondents did not discuss possible tensions, so the author brought it up for that purpose.***

- *Is the hospital's reaction aligned with the Inventory Management practices defined by your staff?*

Explore the possible tensions between clinicians and supply chain staff. (De Vries, 2011), , (Rosenstein, 2004),

- *How do you conceal both interests if there is tension between the clinical and inventory management practices?*

Explore the influence and power of physicians and clinicians. (De Vries, 2011)

- *How do you improve then your IM practices with such tensions?*

Explore how the C-level deals with the influence and power of physicians and clinicians. (De Vries, 2011),

- *Is there anything else you would like to add?*

End of the interview

Appendix L Questionnaire type 2. Surgeons

The author briefly introduced a small presentation, ethical approval, and recording authorization in this part of the interview.

- *Tell me about your hospital.*

Explore complexity, size, the number of beds, wards and ownership.

- *How does the hospital measure its success?*

Explore if Inventory Management pops up.

- *What are the main challenges?*

Explore the needs and pains of the hospital.

- *What type of contract do you have with the hospital? Do most physicians and nurses have the same contract? Is there any other type of contract?*

Explore agent theory, stewardship theory, resource dependency theory, and stakeholders theory.

- *What is the difference between a Public and a Private institution?*

Explore the type of contract

- *And about a not-for-profit and a for-profit institution?*

New material should come

- *What are the hospital's challenges in terms of inventory management?*

Explore and confirm barriers,

- *What is the purpose of an Inventory in your medical practice? Moreover, What would you expect from the inventory management process?*

New stuff may come up. ***This question was modified from the Pilot version, giving a message about the purpose of inventory and not only the definition like the original one.***

- *What are your main challenges in terms of Inventory Management at the wards?*

Explore the barriers to IM practices implementation.

This question allows for dealing with the influence of the stakeholders.

- *Is the standardization of the surgical trays possible? What are the challenges?*

During the Pilot, the physician explained the importance of standardising clinical guidelines. Therefore, the question was included to talk about the surgical trays and the influence of the physicians on them.

- *How would you measure the IM performance at the wards?*

Explore the possible answer and confirm with IM performance KPIs.

- *From 1 to 10, with 1 being the worst practice and 10 the best, what score would you suggest that your hospital is for the IM at the wards?*

Explore the logistics maturity perception. (Bhakoo, Singh and Sohal, 2012).

- *What are the opportunities for improvement?*

New stuff should come up.

- *What are the implications for your medical/clinical practice if you do not have Inventory at any time?*

Explore and try to understand the underlying mechanisms that take place. (Rosenstein, 2004)

- *How do you deal with this situation?*

Explore how the physicians deal with (influence) the IM practice (De Vries, 2011).

- *What are the challenges for the Logistics staff in your hospital? What would be your recommendation to this department?*

New Stuff may come up.

- *Who is accountable for the IM practice in your ward? Are your needs listened to and taken correctly in terms of the Inventory? If not, what do you do?*

New Stuff may come up. ***During the pilot, the logistician answered that the physician's voice was important, and the author wanted to validate this premise and include it in the questionnaire.***

- *What is the role of the nursing department in terms of Inventory Management?*

Nurses are part of the clinical staff. The influence of this stakeholder is not well-developed in the literature. Explore

- *Do you agree with this role?*

Explore

- *If not, why does it happen?*

Explore

- *Is there anything else you would like to add?*

Explore

End of the interview

Appendix M Questionnaire type 3. Logistics

The author briefly introduced a small presentation, ethical approval, and recording authorization in this part of the interview.

- *Tell me about the hospital.*

Explore complexity, size, the number of beds, wards and ownership.

- *How does the Hospital measure its success?*

Explore if Inventory Management pops up.

- *How do you contribute to this plan?*

Explore if Inventory Management pops up.

- *What are your main challenges?*

Explore the needs and pains of the hospital

- *What is your definition of inventory and its purpose?*

Explore the knowledge of SCM concepts according to the IM system

How do you measure your Inventory Management performance? Is there any benchmarking for this IM performance? How is your ranking there?

Explore the KPIs for IM performance. Is it quality, time, finances, or productivity?

- *Who is responsible for the IM performance?*

Explore if it is a C-level priority and the structure of the Supply chain department.

- *How do you manage the Inventory of the Wards or operating theatres?
How is it different from the IM of the Pharmacy and sub-pharmacy?*

Explore the differences in the IM on the operating theatres

Sterilization, instruments, and trays may come up in this question. According to what the literature reported, it is good to explore if there is something new.

- *What are your KPIs for IM performance in the wards?*

Explore if there is something new with what the literature reports.

Who is responsible for defining what to stock in the operating theatres?

Explore the influence of the physicians and the scrub nurses in the IM practice. (De Vries, 2011), (Cox, Chicksand and Ireland, 2005), (Montgomery and Schneller, 2007)

- *How do you control this Inventory? What is the accuracy of your inventory?*

Explore if there are thefts due to the type of hospital. Explore the IM practices found in the literature.

Explore if there comes something NEW.

- *How much is the value or ratio to sales of the Operating theatres' inventory inaccuracies? Is it a different ratio than the Pharmacy's Inventory or the main warehouse inventory inaccuracies?*

Explore if there are thefts due to the type of hospital. Explore if there comes something NEW.

- *Tell me about your replenishment inventory model. What is the practice behind it? How do you manage the replenishment of the operating theatre's inventory?*

Explore the IM practices found in the literature. Explore if there comes something NEW.

- *What are your main challenges in terms of Inventory Management at the wards?*

Explore the barriers to IM practices implementation. This question allows for dealing with the influence of the stakeholders.

- *From 1 to 10, with 1 being the worst practice and 10 the best, what score would you suggest that your hospital is for these KPIs?*

Explore the logistics maturity perception. (Bhakoo, Singh and Sohal, 2012),

- *Furthermore, what is the score that your clinicians would suggest?*

Explore the differences in perceptions and interests of physicians and the supply chain department.

- *Are there any pain clinicians manifesting about the IM practice in the wards?*

Explore the possible tension between clinical practice and supply chain practice. (Cox, Chicksand and Ireland, 2005), (De Vries, 2011), (Montgomery and Schneller, 2007), (Nyaga, Young and Zepeda, 2015), (Rosenstein, 2004), (Veral and Rosen, 2001). ***The author included this question after the pilot because he wanted to explore possible tensions that did not come in the pilot.***

- *How do you deal with them? What is the hospital's reaction to those pains?*

(De Vries, 2011), (Rosenstein, 2004), (Veral and Rosen, 2001)

- *Is the hospital's reaction aligned with the Inventory Management practices defined by your team?*

Explore the possible tensions between clinicians and supply chain staff. (De Vries, 2011), (Rosenstein, 2004), (Veral and Rosen, 2001)

- *How do you conceal both interests if there is tension between the clinical and inventory management practices?*

Explore the influence and power of physicians and clinicians. (De Vries, 2011)

- *How do you improve then your IM practices with such tensions?*

Explore how the C-level deals with the influence and power of physicians and clinicians. (De Vries, 2011)

- *Anything else that you would like to add?*

Explore. *End of the interview*

Appendix N Colombia and its healthcare sector

Colombia, situated in South America, boasts a prominent position as the fourth-largest economy in the Latin American region, following Brazil, Mexico, and Chile in terms of GDP. With a population of nearly 52 million people, it ranks as the third most populous country in Latin America, trailing only Brazil and Mexico (ANDI, 2017). A significant milestone for Colombia was its accession to the OECD (Organisation for Economic Co-operation and Development) in 2020, joining a group of 38 mainly developed nations (OECD, 2021).

This integration marks a crucial step in the country's economic and political trajectory. In addition, in 2016, it witnessed a landmark event in Colombian history, as the nation signed a historic peace agreement with the Marxist guerrilla group FARC (Revolutionary Armed Forces of Colombia), effectively ending a protracted conflict that had spanned 52 years (Santos, 2019). This monumental agreement paved the way for transformative changes within Colombia, reshaping its political landscape and societal and economic dynamics (Santos, 2019)

Healthcare Funding Mechanisms

Colombia's healthcare landscape is significant in its South American regional identity. In 1993, the nation established a National Health System to achieve comprehensive public healthcare coverage (Bernal and Gutierrez, 2012). Notably, as of 2021, an impressive 94.7% of the population had gained access to public healthcare coverage, a remarkable transformation from the mere 20% coverage reported in 1990 (OECD, 2021). However, compared to other OECD countries, Colombia's healthcare expenditure per capita remains notably lower, at approximately \$1,276 annually. In contrast, countries like the UK invest approximately \$4,500 per capita annually, whilst the OECD's average annual healthcare expenditure hovers around \$4,000 (OECD, 2021).

The primary sources of funding for Colombia's National Health System include employee taxes, contributions from employers, and government revenues at both the national and local levels. Approximately 4.5% of the wealthiest population opts for private insurance, allowing them to choose their preferred hospitals and

clinical specialists. Within the scope of this study, two hospitals operate under the umbrella of national public coverage, whilst the other two rely on private funding through insurance or out-of-pocket schemes (Bernal and Gutierrez, 2012)

As a result of the low healthcare expenditure for universal coverage, which encompasses a wide range of medical procedures and pharmaceutical products, there is substantial pressure to reduce and control costs in public funding hospitals. Conversely, hospitals compete to attract private insurance companies and out-of-pocket paying patients in private funding, requiring investments in hospitality, service quality, and access to well-known physicians. This blend of public and private financing mechanisms is crucial to ensuring access to healthcare services for most of Colombia's population (Bernal and Gutierrez, 2012)

Medical Leadership in Latinoamerica

Furthermore, Colombia boasts a well-deserved reputation for healthcare excellence within the Latin American region (Bernal and Gutierrez, 2012). Several of its hospitals have earned commendable positions in clinical rankings specific to Latin America. These accolades underscore the nation's dedication to providing high-quality medical services and maintaining competitive healthcare standards (Valencia and Park, 2018). As Colombia continues to make strides in enhancing its healthcare infrastructure and practices, it is essential to delve into the intricacies of its healthcare supply chain, as this is a pivotal component in maintaining and further elevating its esteemed status in the Latin American healthcare landscape. Through an in-depth examination of the dynamics and influences in Colombia's healthcare supply chain, this thesis aspires to contribute to the ongoing efforts to improve healthcare accessibility, affordability, and quality in the country and the broader Latin American region.

In addition to its economic and political significance, Colombia faces several pressing healthcare challenges that underscore the importance of studying its supply chain. One notable factor is the demographic shift characterized by an ageing population (OECD, 2021). As life expectancy in Colombia steadily rises,

the nation faces an increased demand for healthcare services, particularly among its elderly citizens. This demographic shift places mounting pressure on healthcare costs, a challenge exacerbated by certain pharmaceutical and medical technologies' constrained price regulation within public funding institutions. These complexities create a compelling backdrop for exploring supply chain management in Colombian healthcare, where efficient practices and effective strategies for managing costs and resources are imperative (ANDI, 2017). This thesis aims to shed light on the intricate interplay of stakeholders, contextual factors, and power dynamics within this evolving healthcare landscape, offering insights that can contribute to more sustainable and patient-centric healthcare supply chain practices in Colombia.